THE Petroleum Engineer

# COMBINED EDITION

- Drilling and Producing
- Refining and Gas Processing
- Oil and Gas Pipelining

OCTOBER, 1950 • VOLUME XXII • NUMBER 11

## GENERAL

Round Up of World Oil Activities ..... A-39
*Ernestine Adams*
Is American Petroleum the Cause or Result of the Greatest Prosperity Known in History ..... A-59
*Gail F. Moulton*
Atomic Energy is Latest Petroleum Research Tool ..... A-66

### Features

Course of Oil ..... A-4
Scanning Washington's Oil Horizon ..... A-8
Highlights in Oildom ..... A-10
National Petroleum Situation ..... A-12
Petrolic Personalities ..... A-14
*Dick Sneddon*
Meetings ..... A-18
Letters to the Editors ..... A-22
Petroleum Profile—Lewis W. MacNaughton ..... A-68
General News ..... E-1
General Personals ..... E-6
The Petroleum Engineer's Continuous Tables ..... E-13
*(Installment No. 159—Bibliography)*
Laugh With Barney ..... E-20
Oil and Gas Trade News ..... E-22
Trade Personals ..... E-30
Machinery and Equipment ..... E-39
Trade Literature ..... E-48
Book Reviews ..... E-51

## DRILLING AND PRODUCING

New Oil and Gas Fields of Western Canada ..... B-7
*K. Marshall Fagin*
Gas Lifting Oil in the Turner Valley Field ..... B-32
*S. F. Shaw*
Exploration Speeded in Peace River by Aeromagnetic Survey ..... B-36
*Thomas O'Malley*
Vacuum Tank Trucks Move Mud ..... B-45
*Claribel Thompson*
Casing Set to Bottom Given Credit for Preventing a Serious Blowout ..... B-48
The Redwater Oil Field ..... B-50
*J. V. Drumheller*
Winter Problems of Exploration Crews ..... B-56
*L. O. Rowland*
Seismograph Operations in North Alberta's Bush Country ..... B-63
*E. Joe Shimek*
Permian Oil Basin Show in Odessa, Texas ..... B-69
New Formation Fracturing Service Announced ..... B-70
Patoka Benoist Water Flood ..... B-72
*H. S. Barger*
Critical Pressures in Oil Well Cementing ..... B-86
*Norman C. Wells*

### Features

Editorial—Economics of Canadian Production ..... B-3
News ..... B-92
What's Doing in Drilling ..... B-94
Exploration Activities ..... B-99
Running Tour with Men in the Industry ..... B-102

## REFINING AND GAS PROCESSING

Operations at Abadan ..... C-7
*V. S. Swaminathan*
Modern Refinery in Western Venezuela Goes on Stream ..... C-16
*H. C. Plummer*
Petroleum Refinery Instrumentation—Part 2 ..... C-24
*Douglas M. Considine*
Refinery Expansion in the Netherlands ..... C-34
*V. S. Swaminathan*
Modern Pipe Welding Practices—Part 3 ..... C-38
*F. C. Fantz*
Calibration of Differential Type Liquid Level Meters ..... C-44
*Robert Tobi*
Ultra-Modern Ideas Used in Carthage Plant ..... C-45
*Arch L. Foster*
Bordeaux Completes 2-Year Plan ..... C-56

### Features

The Turnaround ..... C-3
The Technical Forum ..... C-49
News ..... C-54
Personals ..... C-58

## OIL AND GAS PIPELINING

Operating the ULE-AMUAY Pipe Line ..... D-5
*H. J. Hanlon*
The Story of Interprovincial ..... D-12
*Frank H. Love*
Microwave on Long Systems ..... D-26
*M. G. Staton*
Small Barges for Brazilian Service ..... D-36
Gas Line to Central Arkansas ..... D-39
*Frank H. Love*

### Features

The Firing Line ..... D-3
*What Interprovincial Means to Canada*
Pictorial ..... D-34
News ..... D-43
Personals ..... D-46
Pipe Line Projects ..... D-48
With the Pipe Line Contractors ..... D-52

The PETROLEUM ENGINEER Publishing Company, Irwin-Keasler Building, DALLAS 1, TEXAS. W. L. LOVE, *President*; W. T. BRYAN, *General Manager and Treasurer*. Editorial Staff—K. C. SCLATER, *Vice President and Editor-in-Chief*; ERNESTINE ADAMS, *Managing Editor*; K. MARSHALL FAGIN, *Editor, Drilling and Producing*; ARCH L. FOSTER, *Editor, Refining and Gas Processing*; FRANK H. LOVE, *Editor, Oil & Gas Pipelining*; MARY MORRIS, *Editorial Assistant*; RICHARD SNEDDON, *Editor, Pacific Coast*, 1106 B North Louise Street, Glendale 7, Calif., Phone Citrus 2-8446. Advertising Staff—T. J. CROWLEY, *Vice President and Advertising Manager*; New York—JOE B. WOODS, 52 Vanderbilt Avenue, New York 17, New York, MUrray Hill 4-1880; Chicago—E. V. PERKINS, 22 West Maple Street, Chicago 10, Ill., SUperior 7-1823; Los Angeles—RICHARD P. McKEY, Bendix Bldg., 1206 South Maple, os Angeles 15, Calif., PRospect 3919. Promotion—ABBOTT SPARKS, *Manager*; ROYAL COURTNEY, *Assistant Circulation Manager*.
Copyright 1950 by The Petroleum Engineer Publishing Company.
Indexed by Industrial Arts Index and The Engineering Index, Inc. Member of Audit Bureau of Circulation and Associated Business Papers.

# the course of OIL

## AN EMERGENCY STOCKPILE

DEVELOPMENTS in the oil industry on the North American continent outside of the United States have greater interest than usual because of unsettled world conditions. This is particularly true of oil developments in Canada. Operations in this region in recent years have been startling in their outcome. For example, land under reservation for oil prospecting rose from 20 million acres in 1946 to 115 million acres in 1949; the number of geophysical parties in the field rose from 11 to 105; exploration and development expenditures increased from 12 million to 100 million dollars; the number of oil wells completed increased from 59 to 580, and the estimated proved reserves climbed from 44 million in 1946 to one billion barrels in 1949. Today, Canada's oil reserve is estimated to be about 10 years in terms of the national demand.

Refining capacity is expected to show a rapid increase. Expenditures of more than 16 million dollars in refineries were planned early this year by two major companies.

Gas development in Canada has also made tremendous strides. Recent estimates of gas reserves are from five to seven trillion cubic feet and are based on a figure of five to seven trillion cubic feet of gas for each million barrels of oil discovered.

What is the significance of these developments in terms of military security of the North American continent? On this point a Canadian oil executive has this to say:

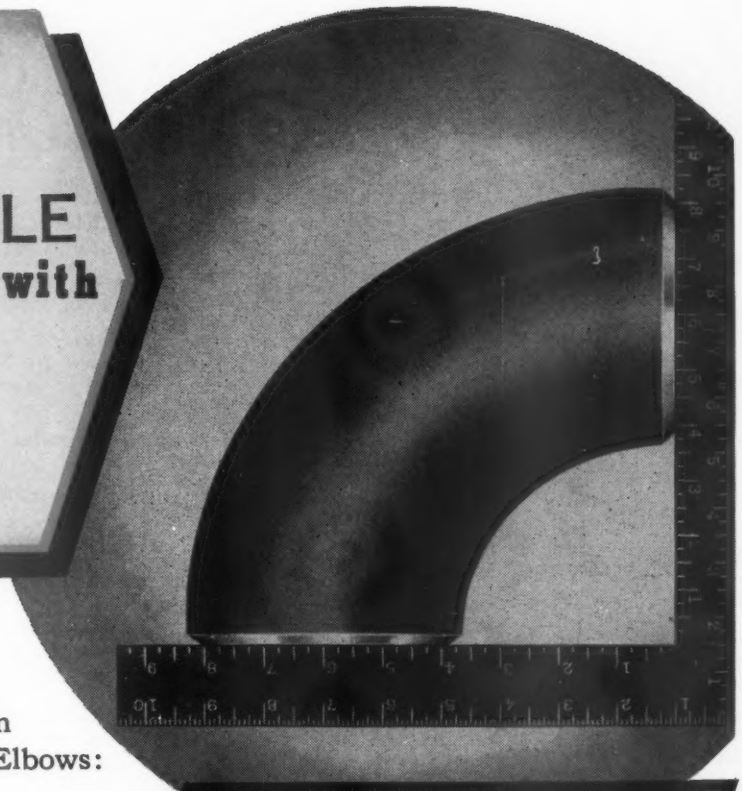
"An important consideration is that of strategy, for in times of military emergency one would expect that the two countries would pool their resources as they did in the last conflict. From this point of view, the development of large Canadian reserves could be regarded as a sort of stock-pile of material for Canada and the United States, just as United States reserves proved to be in 1939-45. Additional reserves in the ground in any part of the continent not only serve as insurance against war but will reduce uneconomic 'stock-piling' such as when materials have to be stored above ground, or, when failing generous supplies of crude oil petroleum products have to be assured through costly stand-by plants for the manufacture of synthetic fuels.

"From the strategic point of view, the question of whether petroleum should or should not be traded back and forth between Canada and the United States in peacetime seems to boil down to this: what policy does most to build up reserves within the continent and set up the shortest and most efficient supply lines? Of one point we can be sure: the development of petroleum reserves in western Canada has already added substantially to the military security of the continent."

K. C. S.

# Exact
## INCLUDED ANGLE
**Assures a perfect fit with**

**MIDWEST**
**WELDING ELBOWS**



There's a reason why work zips along faster, why welders do better work when you specify Midwest Welding Elbows: Exact Included Angle.

This dimensional accuracy is possible because of Midwest's extra manufacturing step of final sizing in compression and simultaneous machine beveling in special machines built by Midwest.

All Midwest Welding Fittings are available through your Jones & Laughlin Supply store. Whether you buy one or a carload your nearby store will be glad to serve you.

*Member Petroleum Equipment Suppliers Association*

**MIDWEST**
WELDING FITTINGS IMPROVE DESIGN AND REDUCE PIPING COSTS

**80 Stores**
**17 Sales Offices**
**& Resident Salesmen**

"... here's MY warehouse!"

# Jones & Laughlin Supply Company

**Subsidiary of**
**Jones & Laughlin**
**Steel Corporation**

**J&L STEEL**

**TULSA , OKLAHOMA**

**EXPORT: 405 LEXINGTON AVE., NEW YORK, N.Y. U.S.A.**

# *Scanning* WASHINGTON'S OIL HORIZON

WASHINGTON—Secretary Chapman has decided to set up a separate agency for petroleum after hearing the industry's protests against being lumped with coal and power in the Interior Department's administration of controls and other provisions of the Defense Production Act—the DPA, as it is called.

The plan now, according to what Chapman has told industry leaders, is for a new petroleum administration headed by a prominent oil man who, as deputy administrator, will report to the Secretary, personally. The staff, which may total several hundred when fully organized, will be drawn mostly from industry.

Chapman disclosed that he was working on Bruce K. Brown to take this job. Brown organized and ran PAW's aviation gasoline program during the last war. He is now chairman of the Military Petroleum Advisory Board, a panel of industry experts advising the top war planners.

After the war, Brown returned to Standard Oil Company (Indiana) as a vice president. Then he was named head of Pan Am-Southern, an integrated subsidiary company headquartered at New Orleans. That is where he is at present.

Originally, Chapman had tried to tempt Ralph K. Davies (Ex-PAW) to accept appointment as the Undersecretary of the Interior, supervising minerals, power and fuels under the DPA. But neither Chapman nor President Truman could talk Davies into coming back to Washington (unless, as Davies said, there is an all-out war needing his services in which event he would serve in any capacity the government wanted).

Temporarily, a minerals-and-energy unit has been established in Interior to work with other government departments under the DPA. Later, along with a separate agency for oil and gas, there will be deputy administrators for minerals and power, too.

▸ **Powers Delegated.** President Truman, as expected, delegated to Interior Department all of the DPA's powers for priorities, allocations and inventory controls on oil, gas, solid fuels, and electric power. But they may remain dormant unless there is a shortage of fuels.

In that case, Interior would have authority to impose priorities on the use of oil or gas and other fuels, allocate supplies right down to the retail level and set limits on the amounts that could be held in inventories.

Price control and rationing authority was delegated to a new OPA-like agency, the Economic Stabilization Administration, which would handle these controls on petroleum, if that should become necessary.

▸ **Materials.** Similar powers over steel and other materials were delegated to the Commerce Department, which has already issued an anti-hoarding order limiting stocks on hand to "practicable minimum working inventory". Included under this order were caustic soda, soda ash, benzene, chlorine; steel plates, standard pipe and tubing, structural shapes and piling; and tin plate and terne plate.

Down the road, Commerce Department likely will ask Interior to administer these and other controls on materials as used by the oil and gas industries. Interior will also function as the claimant agency for materials needed by the industries under its jurisdiction, with Commerce doing the overall allocating.

▸ **Oil Transportation.** Interior was given jurisdiction over oil and gas pipe lines—but that was all. Terminaling facilities, for example, went to the ICC along with control over barges, tank cars, and tank trucks. Commerce Department got tankers. But, prodded by industry leaders mindful of confusion that prevailed the last time when jurisdiction over specialized forms of oil transportation was split up, Secretary Chapman is trying to get control over all such facilities.

▸ **Voluntary Programs.** Indications are that the Truman Administration will try to accomplish the aims of the military preparedness program with a minimum use of controls, utilizing voluntary agreements wherever possible. Under the DPA, there is anti-trust law exemption for any such program requested by the government provided that the official in charge (Chapman for petroleum) has first obtained the Attorney General's approval.

▸ **Avgas.** An industry-wide avgas program may be launched soon, it was indicated by Secretary Chapman's recent telegram to refiners. He called upon refiners not to use alkylate in anything except aviation gasolines of Grade 100/130 or higher. Refiners were asked to report their anticipated shortages or surpluses of avgas components. When this information is in, "we expect to arrange transfers between refineries," Chapman said. If a cut in octane ratings of civilian motor fuels becomes necessary, it probably will be done by an inter-refinery agreement rather than regulation.

▸ **Synthetics.** For awhile, the Bureau of Mines hoped it might get back-door approval of its proposed commercial-size synthetic fuels plant. The B of M proposed that a coal hydrogenation plant be built to supply much needed benzene, xylenes, and toluene with the talk of synthetic fuels as a by-product shoved into the background. But it seems more likely now that the National Security Resources Board will decide an expansion of plants to make these products from petroleum as the quickest way. The B of M project will be held in reserve.

▸ **Plant Financing.** Whenever Interior finds that construction of an oil facility is needed for the military program, it becomes mandatory on the RFC and other lending agencies to make the necessary financial arrangements for a private company to do it. The new tax law will provide for five-year amortization. Government commitments to purchase plant output will also help a company to pay for such projects out of current earnings.

▸ **Fuels Study.** Senator Thomas of Oklahoma has been "talked out" of his opposition to the Myers Resolution for a study of oil, coal, gas, and other fuels by the Senate Interior Committee with a view to developing a national policy on fuels, the uses and reserves thereof. Oil men fear that this may bring forth recommendations for "end use" controls on oil and gas. Help for the coal industry was obviously the aim of Senator Myers who faces a tough fight for re-election in Pennsylvania. Funds for the investigation were limited to $20,000 but, once over the first hurdle, it is easy for the proponents to get more later.

▸ **Refinery Wages.** Labor Department wants the labor-management panel to speed up its determination of the prevailing minimum wage at refineries. Once this is set, all refiners with government contracts of over $10,000 must pay at least this ra[illegible]

# HEAVY-DUTY for STEADY OUTPUT

## *on dragline work...*

Koehring heavy-duty 205 handles ½ to ¾-yd. buckets, depending on weight of bucket, materials and boom length (30 to 50'). You get better bucket control and longer cable life because full-revolving fairlead maintains straight drag cable lead, with bucket at any working angle. What's more, every 205 operation is independent. It swings, hoists, travels, raises or lowers boom all at the same time . . . gives you more production every shift. There's no time-out for continuous manual clutch adjustments . . . no "compromise" settings. Heat compensator springs on main drum, swing and traction clutches make all tension changes automatically . . . maintain full clutch efficiency at all times. All this adds up to less time out, steady output for you.

**Koehring 205 also handles ½-yard shovel or hoe dipper . . . 7¾-ton crane. Mounts on heavy-duty crawlers, or on pneumatic tires for fast, mobile truck service. Other Koehring sizes: ¾-yard 304 . . . 1½-yard 605 . . . 2½-yard 1005. Whatever size or type you need, your local Koehring distributor has the lowest-cost answer . . . see him soon.**

KOEHRING HEAVY DUTY

**KOEHRING COMPANY**
**MILWAUKEE 10, WIS.**

*Subsidiaries:* KWIK-MIX • PARSONS • JOHNSON

# HIGHLIGHTS IN OILDOM

**Colombia Seeks Oil Investors.** Colombia may make its petroleum industry more attractive to foreign capital, Manuel Carvajal Sinisterra, the new minister of mines and petroleum has indicated. He stated that his country should make it easier for foreign capital to obtain concessions. Laureano Gomez, Colombian president, remarked before that his government would give complete guarantee to foreign investors and relax restrictions on the export of earnings.

**Oilmen Join Gas Price Fight.** The Federal Power Commission is being besieged with requests to intervene in a proceeding against Phillips Petroleum Company in which the FPC contends that it has the right to fix the field price of natural gas sold by Phillips to interstate pipe lines. The Texas Independent Producers and Royalty Owners Association and more than 2000 individual independent producers and royalty owners state they are not interested in any action to regulate Phillips other "than with respect to sales of natural gas," and that they "make every effort to prevent the FPC from issuing any order that would apply to field sales of gas made by true independent producers and royalty owners."

**Being Neighborly States.** True inter-state cooperation was practiced recently when Colorado borrowed the services of Walker T. Pound, director of conservation for the Oklahoma Corporation Commission. Governor Johnson of Colorado requested Pound's services be made available to the Gas Conservation Commission of Colorado, which faced a problem it felt that Pound, with his past experience in similar ones, could handle adequately. The Oklahoma Commission readily agreed to lend Pound's service.

**Predicts Lower Prices.** Imperial Oil's gasoline prices in most areas of Manitoba and Saskatchewan will be lower this fall, John R. White, executive vice president of Imperial believes. The price change, he said, will reflect operation of the Interprovincial pipe line, which will reduce the cost of transporting crude oil. Another reduction, general throughout the prairies, will probably come with the opening of navigation on the Great Lakes next spring, White said.

He warned that any price predictions made today are dependent on world oil prices; but regardless of those prices, Winnipeg prices next year will be "between four and five cents a gallon lower than if the crude oil movement to the east had not taken place."

**Canadian Drilling.** Another oil activity record will be set in Canada, according to Charlie Newington, representative of The Bank of Nova Scotia at Calgary. Oil operations in southwestern Canada will hit an all-time high in exploration and drilling, Newington believes, although production of oil has increased but slightly due to lack of transportation. This will be remedied this winter with completion of the Interprovincial pipe line from near Edmonton to Superior, Wisconsin.

**Fabulous East Texas Field.** After 19 years the country's most illustrious oil field is still producing. The vast East Texas field, which has an undetermined birth date, was opened in October 1930 by C. M. "Dad" Joiner. So old-timers believe it was only 19 years old last month. By 1931, when the boom got underway, geologists thought the underground reserve might produce as much as 1,000,000 bbl, but the Texas Railroad Commission records show that between the time of Joiner's strike and July 1, 1950 the East Texas field has produced 2,658,672,771 bbl of oil. Predictions now are that the field will double that figure before it passes into history.

**Industry-Wide Bargaining.** Oil men were urged to learn a lesson from the experience of the coal industry, and avoid industry-wide bargaining. The price may be high, but no price is too high, Joseph E. Moody, president of the Southern Coal Producers' Association, told the 48th annual meeting of the National Petroleum Association in Hotel Traymore, Atlantic City.

Moody described step by step the course of the coal industry over the last decade. He said it has been forced to give up its position and freedom in the country's competitive economy, and that frequently small concessions paved the way for fateful trends. He explained: "The willingness of one company to use expediency in its relationship with its employees and the union can eventually lead it to a place where it can no longer control its destiny in a competitive system."

**Engineers May be Scarce.** An increased demand for all types of engineers to fill mobilization needs may result in a serious shortage of engineers in the near future. Well qualified engineers, graduating in June, had largely been absorbed by industry before the impact of the Korean crisis. Increased demands for their services, both by the armed forces and industry, cause the manpower committee of the American Society for Engineering Education to predict a shortage, in a report sent to the Colorado School of Mines.

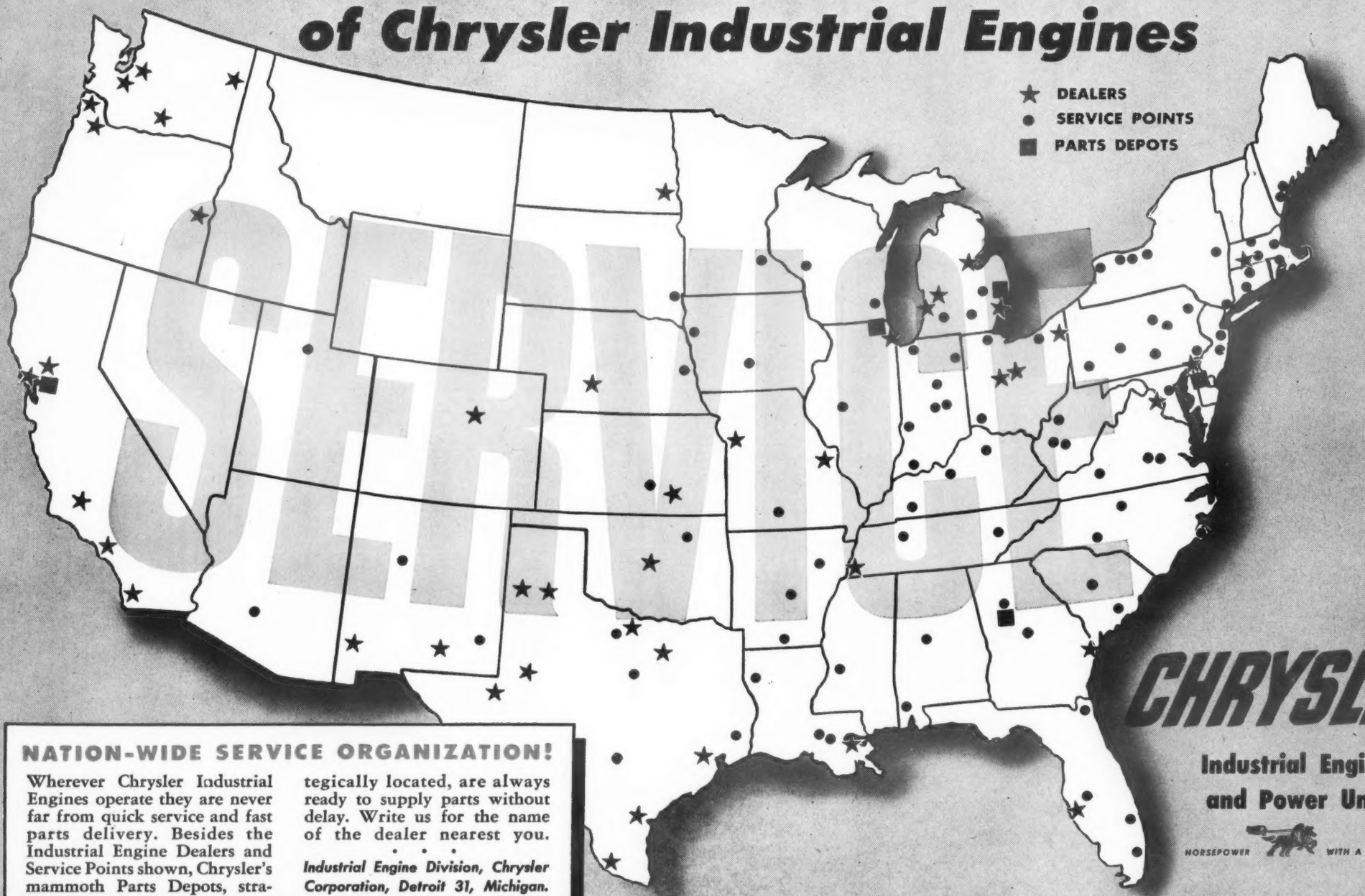
Large industries employing these skilled workers have stepped back, during the last few weeks, into the market for engineering graduates, this, in spite of the large number entering the job market upon graduation in June. Although there is an immediate concern that the present supply of well qualified engineers may be inadequate, the outlook for the years ahead is still more serious. Coupled with increased mobilization and industry demands is a sharp reduction in the number of engineering graduates in prospect for the next 5 years or more.

**Partially Free Economy.** The power behind Washington—capital of world democracy—is the productive power of American industry, the 48th annual meeting of the National Petroleum Association was told by Walter Chamblin, Jr., vice president of the National Association of Manufacturers. Chamblin declared that American business and government face a situation previously unknown—the fact that the traditional system of free, competitive enterprise must now adapt itself to supplying a partially controlled and partially free economy. Chamblin said this change in the status of Washington has far-reaching implications for business. Some have already become manifest, but from now on practically each day will bring some change with it. He added: "Many in the business world have felt that the less they had to do with Washington, the better they could run their business. That day is gone." The NAM leader said this is shown in the ECA and other foreign aid programs. Wars are no longer fought by the sword, he declared, because economic warfare, which employs the productive might of a nation, is now as important as actual combat.

THE GREAT INVISIBLE FEATURE

# THE GREAT INVISIBLE FEATURE

## of Chrysler Industrial Engines




**NATION-WIDE SERVICE ORGANIZATION!**

Wherever Chrysler Industrial Engines operate they are never far from quick service and fast parts delivery. Besides the Industrial Engine Dealers and Service Points shown, Chrysler's mammoth Parts Depots, strategically located, are always ready to supply parts without delay. Write us for the name of the dealer nearest you.

• • •

*Industrial Engine Division, Chrysler Corporation, Detroit 31, Michigan.*

**CHRYSLER**

**Industrial Engines and Power Units**

HORSEPOWER WITH A PEDIGREE

# National Petroleum Situation

By H. J. STRUTH*

**High Demand Sustained.** The high rate of consumption of petroleum and its products was sustained in August. While the demand for motor fuel fell slightly below the peak established in July, the demand for fuel oils more than offset the difference. August demand for all oils set a new, all-time record of 6,986,000 bbl daily, representing an increase over a year ago of 20 per cent. Demand in the first eight months of this year was 11 per cent above that of last year.

**Cumulative Supply Deficit.** While stocks of all oils increased during June, July, and August, there has been a supply deficiency in the first eight months of this year in the order of about 160,000 bbl daily. Cumulative demand averaged about 6,640,000 bbl daily, while supply during the period averaged 6,480,000 bbl daily. Cumulative supply was 7 per cent above last year, while demand was 11 per cent greater. Stocks of all oils were reduced this year by about 38,000,000 bbl, whereas during the same period of last year they increased nearly 18,000,000 bbl. Indicated stocks on August 31 were about 59,000,000 bbl below a year ago, a decline of 10 per cent.

*Petroleum Consultant, Dallas, Texas.

**Heavy Fuel Demand.** Advance buying of fuel oils in August increased the demand to 2,343,000 bbl daily, which was over 300,000 bbl a day greater than a year ago. Fuel oil demand is 16 per cent above last year, while stocks are 23 per cent lower. Efforts to build up fuel oil stocks to required working levels are shown by the increased refinery production of fuel oils, and by the higher rate of imports of that product. The daily fuel oil supply in August was composed of 2,278,000 bbl of refinery production; 232,000 bbl of imports, and about 20,000 bbl of transfers of crude oil to fuel oil. The excess supply, added to stocks in August, amounted to about 187,000 bbl daily. Market requirements next winter dictate the need for substantial stock accumulations over the balance of this year.

**Active Wildcat Drilling.** Wildcat well completions in the first eight months of this year were 13 per cent above last year. A total of 5,056 wildcats were drilled this year, compared with 4,750 drilled in the same period of last year. The dry hole hazard has been greater this year, with 82 per cent dry holes on the average, and with an increase in the number of dry holes amounting to 14 per cent more than last year.

## Comparative Statistics, August, 1950

*All figures are computed on a Bureau of Mines' Basis**

| | August 1950Ⓟ | July 1950(r) | August 1949 | This Year to dateⓅ | Last Year to date | Per cent change |
|---|---|---|---|---|---|---|
| Total supply,* all oils | 216,567 | 211,866 | 180,290 | 1,574,667 | 1,469,686 | + 7 |
| Daily average | 6,986 | 6,834 | 5,816 | 6,480 | 6,048 | |
| Total demand,‡ all oils | 215,709 | 207,449 | 191,039 | 1,613,516 | 1,451,689 | +11 |
| Daily average | 6,958 | 6,692 | 6,163 | 6,640 | 5,974 | |
| Change in stocks | +858 | +4,417 | —10,749 | —38,849 | +17,997 | |
| Crude supply* | 193,350 | 188,800 | 160,987 | 1,379,951 | 1,325,529 | + 4 |
| Daily average | 6,237 | 6,090 | 5,193 | 5,679 | 5,454 | |
| Crude demand‡ | 196,900 | 188,987 | 167,988 | 1,394,757 | 1,321,571 | + 5 |
| Daily average | 6,352 | 6,096 | 5,419 | 5,740 | 5,438 | |
| Crude stocks | 237,850 | 241,400 | 260,585 | 237,850 | 260,585 | — 9 |
| Days supply | 37 | 40 | 48 | 37 | 48 | |
| Natural gasoline production | 15,200 | 15,050 | 13,043 | 115,966 | 100,093 | +16 |
| Daily average | 490 | 485 | 421 | 477 | 412 | |
| Motor fuel production | 90,900 | 88,700 | 82,232 | 663,598 | 635,048 | + 4 |
| Daily average | 2,932 | 2,861 | 2,653 | 2,731 | 2,613 | |
| Gasoline yield per cent | 44.0 | 43.6 | 44.5 | 43.5 | 44.4 | — 0.9 |
| Motor fuel demand‡ | 93,800 | 94,677 | 88,652 | 668,722 | 630,993 | + 6 |
| Daily average | 3,026 | 3,054 | 2,860 | 2,752 | 2,597 | |
| Motor fuel stocks | 105,300 | 108,200 | 105,115 | 105,300 | 105,115 | 0 |
| Days supply | 35 | 35 | 37 | 35 | 37 | |
| Fuel oil production | 70,610 | 68,150 | 61,386 | 522,896 | 501,063 | + 4 |
| Daily average | 2,278 | 2,198 | 1,980 | 2,152 | 2,062 | |
| Fuel oil demand‡ | 72,630 | 66,103 | 62,984 | 626,574 | 542,074 | +16 |
| Daily average | 2,343 | 2,132 | 2,032 | 2,578 | 2,231 | |
| Fuel oil stocks | 109,450 | 103,650 | 142,880 | 109,450 | 142,880 | —23 |
| Days supply | 47 | 49 | 70 | 47 | 70 | |
| Refinery still runs | 184,150 | 180,800 | 162,485 | 1,346,251 | 1,287,634 | + 5 |
| Daily average | 5,940 | 5,832 | 5,241 | 5,540 | 5,299 | |
| Stocks, all oil | 564,270 | 563,412 | 623,740 | 564,270 | 623,740 | —10 |
| Days supply | 81 | 84 | 101 | 81 | 101 | |

## Current Crude Oil Prices

| | | | |
|---|---|---|---|
| U. S. Average | $2.56 | Louisiana | $2.62 |
| Texas | 2.61 | Arkansas | 2.43 |
| California | 2.42 | New Mexico | 2.40 |
| Oklahoma | 2.62 | Mississippi | 2.23 |
| Kansas | 2.62 | Illinois | 2.76 |
| | | Other states | 2.60 |

**Basic crude prices:**

| | |
|---|---|
| Oklahoma-Kansas (36 gr.) | $2.57 |
| Texas Gulf Coast (36 gr.) | 2.80 |
| East Texas | 2.65 |
| West Texas (36 gr.) | 2.44 |
| California Signal Hill (26 gr.) | 2.31 |
| Pennsylvania, Bradford | 3.65 |

## Drilling and Production Statistics

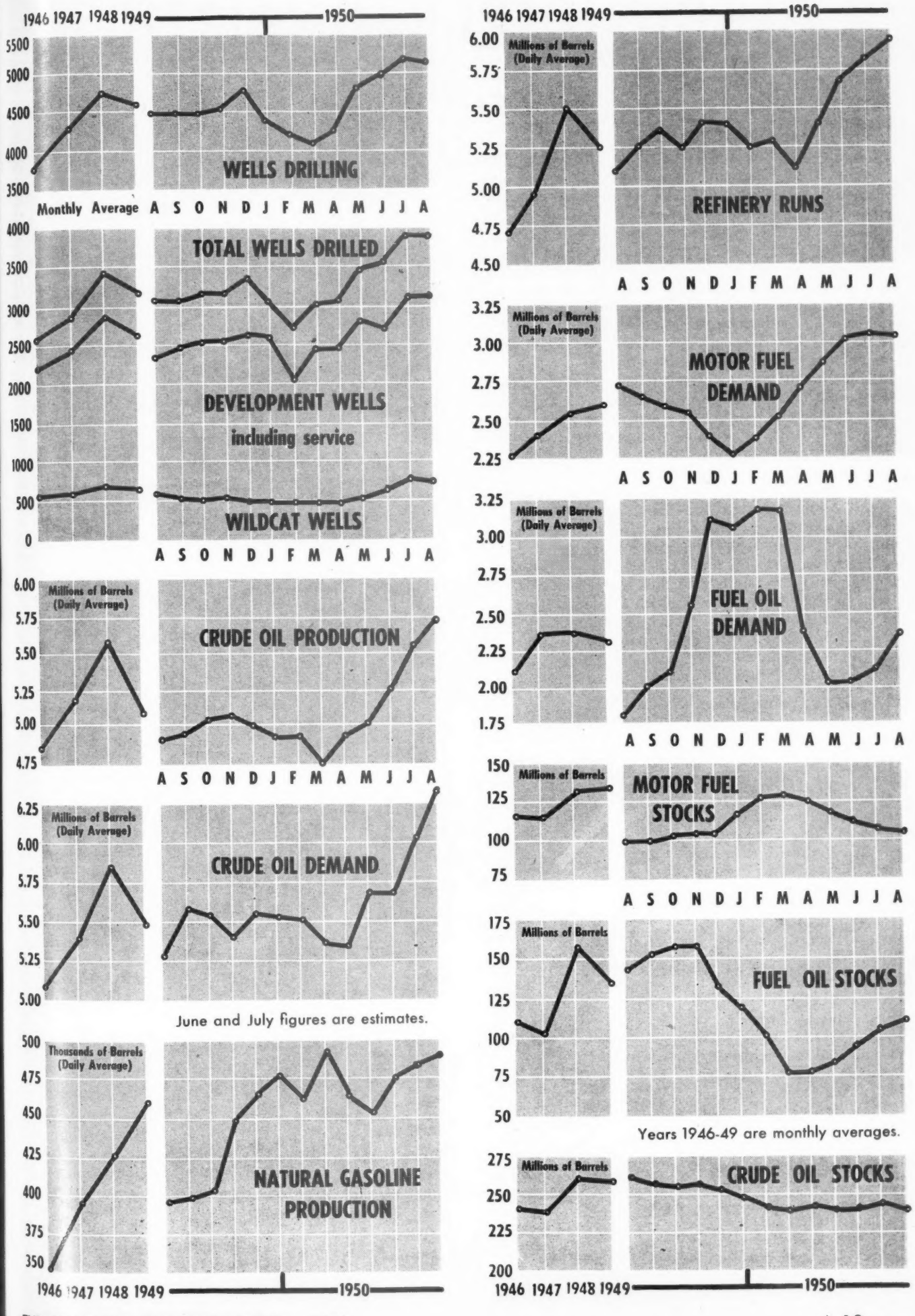
| | August 1950Ⓟ | July 1950Ⓟ | August 1949 | This Year to date | Last Year to date | Per cent change |
|---|---|---|---|---|---|---|
| Wells Drilling | 5,175 | 5,220 | 4,640 | 5,175 | 4,640 | +12 |
| Total wells drilled | 3,941 | 3,941 | 3,247 | 27,572 | 25,404 | + 9 |
| Development wells | 3,140 | 3,130 | 2,532 | 21,993 | 20,121 | + 9 |
| Oil | 2,051 | 2,092 | 1,655 | 14,977 | 13,588 | +10 |
| Gas | 260 | 240 | 243 | 1,711 | 1,783 | — 4 |
| Dry | 829 | 798 | 634 | 5,305 | 4,750 | +12 |
| Per cent dry | 26.4 | 25.5 | 25.0 | 24.1 | 23.6 | + 0.5 |
| Service wells | 76 | 76 | 88 | 523 | 807 | —35 |
| Wildcat wells | 725 | 735 | 627 | 5,056 | 4,476 | +13 |
| Oil | 118 | 112 | 105 | 776 | 708 | +10 |
| Gas | 11 | 12 | 16 | 135 | 120 | +12 |
| Dry | 596 | 611 | 506 | 4,145 | 3,648 | +14 |
| Per cent dry | 82.2 | 83.1 | 80.7 | 82.0 | 81.6 | + 0.4 |

### By States

| | | | | | | |
|---|---|---|---|---|---|---|
| Wells drilled (excl. service) | 3,865 | 3,865 | 3,159 | 27,049 | 24,597 | +10 |
| Arkansas | 34 | 40 | 29 | 264 | 215 | +23 |
| California | 174 | 183 | 182 | 1,194 | 1,699 | —30 |
| Illinois | 315 | 312 | 261 | 1,838 | 1,645 | +12 |
| Kansas | 324 | 337 | 300 | 2,391 | 2,122 | +13 |
| Louisiana | 235 | 217 | 231 | 1,624 | 1,503 | + 8 |
| Mississippi | 28 | 20 | 29 | 215 | 232 | — 7 |
| New Mexico | 67 | 33 | 35 | 418 | 324 | +29 |
| Oklahoma | 483 | 517 | 397 | 3,534 | 2,783 | +27 |
| Texas | 1,411 | 1,489 | 1,084 | 10,773 | 9,247 | +16 |
| Other states | 794 | 717 | 611 | 4,798 | 4,827 | — 1 |
| Wildcats drilled | 725 | 735 | 627 | 5,056 | 4,476 | +13 |
| Arkansas | 12 | 12 | 9 | 76 | 43 | +77 |
| California | 49 | 44 | 44 | 277 | 339 | —18 |
| Illinois | 67 | 67 | 58 | 434 | 306 | +42 |
| Kansas | 71 | 63 | 52 | 470 | 335 | +40 |
| Louisiana | 29 | 27 | 24 | 184 | 214 | —14 |
| Mississippi | 11 | 9 | 11 | 89 | 72 | +24 |
| New Mexico | 8 | 4 | 5 | 50 | 53 | — 6 |
| Oklahoma | 74 | 75 | 91 | 567 | 540 | + 5 |
| Texas | 271 | 306 | 241 | 2,111 | 1,958 | + 8 |
| Other states | 133 | 128 | 92 | 798 | 616 | +30 |
| Daily crude production | 5,737 | 5,589 | 4,780 | 5,201 | 5,042 | + 3 |
| Arkansas | 88 | 85 | 77 | 86 | 82 | + 5 |
| California | 908 | 900 | 896 | 875 | 928 | — 6 |
| Illinois | 176 | 173 | 182 | 171 | 175 | — 2 |
| Kansas | 326 | 321 | 257 | 296 | 279 | + 6 |
| Louisiana | 581 | 577 | 499 | 556 | 515 | + 8 |
| Mississippi | 114 | 116 | 101 | 105 | 106 | — 1 |
| New Mexico | 138 | 135 | 128 | 131 | 131 | 0 |
| Oklahoma | 490 | 473 | 400 | 433 | 414 | + 5 |
| Texas | 2,487 | 2,387 | 1,850 | 2,133 | 2,032 | + 5 |
| Wyoming | 174 | 170 | 134 | 160 | 127 | +26 |
| Other states | 255 | 252 | 256 | 255 | 253 | + 1 |

* Unless otherwise stated all figures represent thousands of barrels. ‡ Total demand, including exports. * Includes domestic production and imports. Ⓟ—Preliminary. r–Revised.

Preliminary estimates based upon data supplied by American Petroleum Institute, U. S. Bureau of Mines, State Agencies, and other official sources.


1946 1947 1948 1949 1950
WELLS DRILLING
Monthly Average
A S O N D J F M A M J J A
TOTAL WELLS DRILLED
DEVELOPMENT WELLS
including service
WILDCAT WELLS
CRUDE OIL PRODUCTION
Millions of Barrels (Daily Average)
CRUDE OIL DEMAND
June and July figures are estimates.
NATURAL GASOLINE PRODUCTION
Thousands of Barrels (Daily Average)
REFINERY RUNS
MOTOR FUEL DEMAND
FUEL OIL DEMAND
MOTOR FUEL STOCKS
FUEL OIL STOCKS
Years 1946-49 are monthly averages.
CRUDE OIL STOCKS

# PETROLIC PERSONALITIES

DICK SNEDDON

### Roses Resort to Divining Rod

In a late issue of the New Yorker there is a right interesting piece about one of the nation's leading ornithologists, Dr. Sidney Dillon Ripley II who, as far as we know, is no relation to Fritz Ripley, chairman of the Nomads' Board of Regents, but is a rare citizen nonetheless. It appears that Dr. Sidney, through his mother, is related to the Scottish Roses, a considerable Clan, of which Sir Hugh Rose, first British Commander-in-Chief of India, was a choice representative, and Bob Rose of Drilling and Exploration Company may be another—we'll have to check on this. Anyway, Dr. Ripley, the ornithologist, that is, had recently visited some of the current Roses over in the Land of the Thistle and the Haggis, and we were intrigued more than somewhat to learn that the entire Rose Clan is expert in the business of "dowsing," which means that its members "can locate water (and, we presume, oil) with the divining rod." In fact, Dr. Ripley states that when his sister Julie built a house in Litchfield in 1934 and needed a water supply, his mother—a Rose—"found it 30 ft down with a witch hazel wand." We merely cite this to make it plain that the divining rod is far from being defunct and that there are still many people who are duly impressed by proficiency in foraging for fortunes with a forked stick. It may be presumptuous to drag the family into this, but the Sneddon Clan, stout representatives of the Scottish Lowlands, were never very partial to the use of the witch hazel wand for exploratory purposes. The record shows that they preferred to do their divining with either a twillow or a twash, a twillow being a twig of a willow, and a twash being a twig of an ash.

### Long Distance Doodling

While we are on the subject of divining, some 15 years ago, the late R. D. Matthews, then executive vice president of Union Oil Company of California, brought to this country from Australia an outstanding young rugby player by the name of Greer—as nearly as we can remember—to teach Trojan (University of Southern California) gridders the useful art of drop kicking. It was our pleasure to play host to this fine chap for several days, during which we learned that his mother had accumulated a fairish stack of yellow chips, divining metals in her native land, and at that time still enjoyed an extensive practice.

Then, just a few years ago, we received a letter from a South African gentleman, enclosing a map of Elk Hills. On this he had marked the unproductive sections with strange hieroglyphics, indicating the exact locations and depths at which oil would be found. We sent the map to Standard Oil Company, but whether or not they followed our South African friend's recommendations in the subsequent development of the Naval Reserve we can't say for sure, but we could make a pretty good guess. This, however, is the first time we have known of a property being doodled from such a long way off, and we wouldn't be at all surprised if it constitutes an unbeatable record for diddling doostances, excuse please, distance doodling.

### Sitting on an Antique Current

Continuing on the same topic, Professor Benjamin Silliman, one of the leading scientists of his day, wrote to the Oil City Register on August 28, 1864, as follows: "The pretensions of diviners are worthless. The art of finding fountains or minerals by a peculiar twig is a cheat upon those who practice it, an offense to reason and common sense, an art abhorrent to the laws of nature, and deserves universal reprobation." Twigs, however, it should be noted, were not the only instruments used by discerning individuals to locate underground reservoirs. Nor was Professor Silliman the only person to voice publicly his misgivings with regard to the powers of early oil finders and the infallibility of their methods.

In his interesting book, "Sketches in Crude Oil," published in 1898, John J. McLaurin takes issue with an exponent of anatomical divination in a brief but pointed paragraph to-wit, "J. S. Booker, an Ohio man, claimed to spot gas. His particular virtue lay in the muscles at the back of the neck, which rise up and irritate him in the presence of natural gas. This is ahead of rheumatism as a rain indicator. Booker's own story is that an attack of asthma left him in a sensitive state, so that when he passes over vein of gas, the electricity runs through his legs, up his spine, and knots the muscles of the neck. The story deserves credit for its rare simplicity. With the whole realm of fiction at his command, Booker chose only a few simple details, and was content to pass current as a sort of human witch hazel." Personally, we can't understand McLaurin's skepticism of this case, we know lots of people to whom natural gas is a pain in the neck.

### Punching Bag Champ

Al Dysart, in charge of Brown Drilling Company's operations in Kuwait Neutral Zone, is a husky lad who excels in the manly art of self-defense. As a kid he did quite a bit of sparring in the roped square and he still likes to don the mitts and step a lively round or two. Al has always

**ONLY** W-K-M Valves have a round, full opening passage with the same I. D. as the pipe. This design eliminates turbulence and permits free passage of scrapers.

**ONLY** W-K-M Valves seal off completely on both sides every time.

**It is significant that most of the World's *big* pipelines are tied together with W-K-M Valves. The superior performance that led to their use on these jobs will lead you to specify them for your next job when you investigate their exclusive design and operating advantages.**

**W-K-M Company**

OIL FIELD, PIPE LINE & INDUSTRIAL EQUIPMENT

HOUSTON, TEXAS, U. S. A.

LOS ANGELES

Cable Address: "WILKOMAC"

Export Office: 30 Rockefeller Plaza, New York, N. Y.

argued that fighters are a pretty decent lot, at least they have a wholesome regard for the rights of others. And they are not squandthrifts as is so often contended—most of the boys who retire to Cauliflower Alley have quite a substantial poke.

Al also exhibits an interest in other sports such as baseball, golf, hunting, and fishing, and is very fond of dogs, his favorite species being the English bull. This particular breed, he tells us, has forelegs that are a veritable masterpiece of Chippendale carving, but apart from that he has no other claim to beauty. So much material is used in the construction of his head and shoulders that practically nothing is left for the remainder of his body. His skin, obviously intended for a much larger animal, hangs loosely about his unattractive torso, and he has a bottom jaw like a hippopotamus. Indeed, it is the strain of carrying this thing around that has bowed his forelegs to such a disgusting degree. Despite his appearance of ferocity, however, he is really quite docile, and unless very angry will never eat your arm off beyond the first joint. But, returning to the main topic, Al has now been in the Saudi-Arabian area for some four years and has become a real expert in the peculiarities of operation there. He has not only the mechanical and administrative savvy to handle his distinctly rugged assignment adequately, but also has that stick-to-it-iveness that is a prime virtue in foreign service. In proof of this latter, it might be mentioned that he is probably the only man living who ever rode the rods from Texas to California carrying a pecan pie in his hand. We'll tell you about that adventure some time later.

### *Hey Ho and Over the Ocean Deep*

A post card from Harold Hoots, the well known domino consultant and geologist, summering in Alaska, indicates that he is having more fun than people being convoyed around the farflung reaches of the Polar north by bush pilot; dropping down on lakes and rivers to watch USGS field parties doing their exploratory stuff a million miles from nowhere; fraternizing with Eskimos in their fishing villages; and studying structure and stratigraphy all along the way. After seeing Point Barrow and everything of interest in the area, Harold planned to fly to Anchorage, then take the boat to Seattle via Kodiak, and so to Banff. He apparently managed to crowd in a little fishing during his trip for he talks of catching a 32-inch 11½ lb trout up north of Brooks Range. We don't like to cast any asparagus on the feat, but it is certainly too bad he didn't catch one of the big ones.

In the mailbag also comes a letter from Elmer "Deck" Decker, the big weight indicator man from Long Beach who has been doing Europe for the past three or four months and has been making quite a stir across the pond. His letter was written aboard the *S. S. Italia* and he was very disappointed over the unseemly behavior of the ocean. As he wrote it was heaving in a most distressing manner, and Deck had a strong inclination to do the same thing. We hope one of these days to bring our readers a full recital of the Decker safari and the reflections and observations of the leader himself on the European situation. He is without doubt one of our better reflectors and observers and it will be a great pleasure to bring his comments to his eagerly awaiting public. Another message comes from that genial Hibernian, Tom Hickey, Sr., head of the Hickey Supply Company, and as foine a gintleman as iver came out of Ould Ireland. The elder Hickey has been traipsing around Europe, too, for several months. His letter was datelined from Rome, whence he hoped to duck over to Evin, pick up some four leaf shamrocks, have a chin with a banshee or two, and then hie back home. The adventures of the Hickey party will we hope furnish a future paragraph.

### *Back Among the Bluebonnets*

The habitues of the western rathskellers are clothed in sackcloth and ashes, and there is loud weeping and wailing in the august confines of the Los Angeles Petroleum Club, for O. W. "Tiny" Ward, the rotund lad from Campbell, Texas, has gone back to his native land. The poor chap hasn't been able to take a deep breath for five years. That's how long he has been out in California, stifling in what the Golden Staters term "climate." He was transferred to the San Joaquin Valley from Houston in 1945 by the British American Oil Producing Company, of which he has been a major attachment for some 13 years. Now he returns to Houston, where, this time, he will be associated with the Johnston Oil Well Servicing Company.

Tiny began his oil career as a roughneck in Oklahoma; worked a spell in the marketing department of the Skelly Oil Company; and then in 1937 jumped to B. A. Meantime, he has worked in practically every oil state in the Union, and for some time past has been production manager of British American's western division. Campbell's favorite son has become acquainted with a lot of people during his years in California, and has permitted himself to be about as completely assimilated as a Texan can in what he no doubt considers "foreign territory." We rather fancy, indeed, that if he cared to claim the distinction, he could now declare himself a native Californian with the full approval of native Californians. It might be mentioned in conclusion that Tiny is a much feared man in Los Angeles domino circles. He hasn't been to the boneyard since September 1946 and his end runs out of skunk row are as pretty a piece of peg maneuvering as has been seen since the demise of Long John Silver. He is also a sharp cookie in a cribbage contest, and Houstonians who value their pants should be warned not to tussle with Tiny in any of that fifteen-two, fifteen-four nonsense.

### *A Loss to Our Industry*

It was a great shock to learn of the death of our good Ventura friend, E. C. "Ed" Page in the middle of August. We had had a letter from him just a few days before with an invitation to go fishing "over to the Island." Don't know whether he meant Santa Cruz or Catalina, but anyway we were looking forward to an outing with him. We had noted on our last visit to the Page Testing Laboratory on North Ventura Avenue signs of a profound interest in piscatorial diversion. There were rods and reels, motor boats, creels, and other marks of rapid Waltonianism carefully tucked away in various corners of the imposing new building he had just completed a short time before. It is sad that he didn't live longer to enjoy the prosperity that appeared to be his after 41 years in the oil business. Ed was a likeable chap, widely known and highly regarded among California oil men.

His kindly presence will be badly missed by his many friends and we tender our sincere sympathy to Mrs. Page and the family.

Seventeen years ago he started what was probably the first independent core testing laboratory in the west and in the meantime had gradually built up a sizable clientele, increasing and improving his services and facilities as he went along. Today the Page lab is a thoroughly modern structure, well equipped in personnel and apparatus to perform a wide diversity of field services and tests. Ed was once a member of the Los Angeles Wildcats, a highly exclusive oil men's organization, and in recent years was an active member of Petroleum Production Pioneers. It is our understanding that, in accordance with Ed's wishes, the group of aggressive young chemists who had been working under his direction will continue to run the laboratory.

# AVERAGE PRICES OF SELECTED GRADES OF GASOLINE, KEROSINE AND FUEL OILS, AND LUBRICATING OIL IN THE UNITED STATES, IN CENTS PER GALLON*

**1936 - 1947**

| | Average for year | | | | | |
|---|---|---|---|---|---|---|
| | 1936 | 1937 | 1938 | 1939 | 1940 | 1941 |
| **Gasoline** | | | | | | |
| Average at refineries in Oklahoma (Octane no.)† | 5.95 | 5.81 | 4.90 | 4.76 | 4.50§<br>4.90□ | 5.65 |
| Average at 50 cities: Dealers net (excl tax) | 12.63 | 10.53 | 10.04 | 9.58 | 9.08 | 9.49 |
| Average at 50 cities: Service station (Incl state tax) | 18.44 | 18.99 | 18.51 | 17.74 | 17.16 | 17.73 |
| **Kerosine and Fuel Oil** | | | | | | |
| 41°—43° Gravity W.W. at refineries in Oklahoma | 3.69 | 4.17 | 4.19 | 3.97 | 4.04 | 4.41 |
| Kerosine, Tank wagon at Chicago | 9.75 | 10.04 | 10.31 | 10.00 | 10.00 | 10.20 |
| No. 2 Straw fuel oil at refineries, Oklahoma‡ | 3.31 | 3.83 | 3.88 | 3.37 | 3.47 | 3.69 |
| Bunker C for ships: | | | | | | |
| New York (dollars per bbl) | 1.08 | 1.27 | 1.04 | 1.04 | 1.34 | 1.34 |
| Gulf Coast (dollars per bbl) | 0.91 | 1.01 | 0.81 | 0.83 | 0.90 | 0.87 |
| California (dollars per bbl) | 0.92 | 1.02 | 0.88 | 0.81 | 0.82 | 0.80 |
| Diesel Oil for ships: | | | | | | |
| New York (dollars per bbl) | 1.65 | 2.07 | 1.83 | 1.74 | 1.98 | 1.99 |
| Gulf Coast (dollars per bbl) | 1.50 | 1.81 | 1.67 | 1.53 | 1.64 | 1.56 |
| California (dollars per bbl) | 1.16 | 1.47 | 1.57 | 1.41 | 1.40 | 1.40 |
| **Lubricating Oil** | | | | | | |
| Oklahoma: | | | | | | |
| 200 viscosity, No. 3 color, neutral | 11.22 | 10.46 | 10.44 | 11.14 | 11.56 | 12.23 |
| 150—160 viscosity @ 210°, bright stock, 10—25 pour test | 17.17 | 17.94 | 14.70 | 16.48 | 18.06 | 18.56 |
| Pennsylvania: | | | | | | |
| 200 viscosity, No. 3 color, neutral, 420—425 flash, 25 pour test | 21.39 | 24.25 | 15.48 | 20.03 | 23.56 | 29.42 |
| 600 steam-refined, cylinder stock, filterable | 12.51 | 13.96 | 8.49 | 10.89 | 10.94 | 12.55 |
| Gulf Coast: | | | | | | |
| 500 viscosity, No. 2½—3½ color, neutral | 8.45 | 8.88 | 7.92 | 7.99 | 8.86 | 9.30 |
| **Wax** | | | | | | |
| 122° — 124° white crude scale wax at Pennsylvania refineries (cents per pound) | 2.43 | 2.82 | 2.23 | 3.64 | 3.92 | 4.45 |

| | Average for year | | | | | |
|---|---|---|---|---|---|---|
| | 1942 | 1943 | 1944 | 1945 | 1946 | 1947 |
| **Gasoline** | | | | | | |
| Average at refineries in Oklahoma (Octane no.)† | 5.91 | 5.96 | 5.95 | 5.87 | 6.29 | 8.33 |
| Average at 50 cities: Dealers net (excl tax) | 10.44 | 10.45 | 10.49 | 10.23 | 10.36 | 12.33 |
| Average at 50 cities: Service station (Incl state tax) | 18.93 | 19.03 | 19.09 | 19.00 | 19.27 | 21.61 |
| **Kerosine and Fuel Oil** | | | | | | |
| 41°—43° Gravity W.W. at refineries in Oklahoma | 4.46 | 4.42 | 4.38 | 4.36 | 5.10 | 7.10 |
| Kerosine, Tank Wagon at Chicago | 10.30 | 10.60 | 10.60 | 10.53 | 11.37 | 13.41 |
| No. 2 Straw Fuel Oil at refineries, Oklahoma‡ | 3.82 | 3.63 | 3.63 | 3.75 | 4.32 | 6.65 |
| Bunker C for ships: | | | | | | |
| New York (dollars per bbl) | 1.61 | 1.82 | 1.82 | 1.70 | 1.76 | 2.25 |
| Gulf Coast (dollars per bbl) | 0.89 | 1.03 | 1.02 | 0.97 | 1.26 | 1.83 |
| California (dollars per bbl) | 0.85 | 0.99 | 1.10 | 1.10 | 1.32 | 1.69 |
| Diesel oil for ships: | | | | | | |
| New York (dollars per bbl) | 2.57 | 2.78 | 2.78 | 2.58 | 2.46 | 3.00 |
| Gulf Coast (dollars per bbl) | 1.64 | 1.65 | 1.65 | 1.65 | 1.96 | 2.60 |
| California (dollars per bbl) | 1.41 | 1.43 | 1.45 | 1.45 | 1.98 | 2.75 |
| **Lubricating Oil** | | | | | | |
| Oklahoma: | | | | | | |
| 200 viscosity, No. 3 color, neutral | 15.04 | 15.00 | 14.00 | 12.00 | 14.66 | 18.44 |
| 150—160 viscosity @ 210°, bright stock, 10—25 pour test | 22.75 | 22.75 | 22.75 | 22.75 | 24.16 | 28.88 |
| Pennsylvania: | | | | | | |
| 200 viscosity, No. 3 color, neutral, 420—425 flash, 25 pour test | 30.94 | 26.13 | 30.43 | 30.50 | 32.58 | 39.37 |
| 600 steam-refined, cylinder stock, filterable | 15.06 | 15.00 | 15.00 | 15.00 | 18.35 | 31.53 |
| Gulf Coast: | | | | | | |
| 500 viscosity, No. 2½—3½ color, neutral | 10.00 | 10.00 | 10.00 | 10.00 | 10.63 | 13.31 |
| **Wax** | | | | | | |
| 122° — 124° white crude scale wax at Pennsylvania refineries (cents per pound) | 4.25 | 4.25 | 4.25 | 4.25 | 4.27• | 7.60 |

*Except as noted. □ASTM §L-3

†Octane numbers: 1936, 63—70 to April 15, 68—70 thereafter; 1937, 68—70 to September 20, 67—69 thereafter; 1940, 67—69 (L-3 method) discontinued April 11 and 72—74 (ASTM method) initiated April 8; 1944, 70—74 after July; 1945, 73—75 after July.

‡1936 through 1938 and 1945, no. 1 straw distillate; all others, no. 2 straw fuel oil.

•First seven months only.

Source: U. S. Bureau of Mines, oil companies, and published sources.

*From The Petroleum Data Book, Second Edition, which carries 750 pages of information on the petroleum industry.*

# REFINERS' MARGIN, GULF COAST AREA

| Year | Gasoline | | | | Kerosine | | | |
|---|---|---|---|---|---|---|---|---|
| | Per cent yield | Gal per bbl of charge | Price ¢ per gal (reg grade) | Value $ per bbl of charge | Per cent yield | Gal per bbl of charge | Price ¢ per gal (41°-43° gr W. W.) | Value $ per bbl of charge |
| 1928 | 38.61 | 16.22 | 8.67 | 1.406 | 8.92 | 3.75 | 5.51 | 0.207 |
| 1932 | 43.45 | 18.25 | 4.66 | 0.850 | 7.59 | 3.19 | 3.23 | 0.103 |
| 1936 | 41.93 | 17.61 | 5.10 | 0.898 | 7.65 | 3.21 | 3.80 | 0.122 |
| 1937 | 41.10 | 17.26 | 5.39 | 0.930 | 7.91 | 3.32 | 4.30 | 0.143 |
| 1938 | 42.40 | 17.81 | 5.53 | 0.985 | 8.00 | 3.36 | 4.42 | 0.149 |
| 1939 | 42.96 | 18.04 | 5.12 | 0.924 | 7.77 | 3.26 | 4.17 | 0.136 |
| 1940 | 40.24 | 16.90 | 4.84 | 0.818 | 8.34 | 3.50 | 3.96 | 0.139 |
| 1941 | 42.61 | 17.90 | 5.73 | 1.026 | 7.54 | 3.17 | 4.42 | 0.140 |
| 1942 | 36.80 | 15.46 | 5.89 | 0.911 | 6.37 | 2.68 | 4.48 | 0.128 |
| 1943 | 34.41 | 14.45 | 6.00 | 0.867 | 7.34 | 3.08 | 4.43 | 0.136 |
| 1944 | 37.92 | 15.93 | 5.95 | 0.948 | 6.71 | 2.82 | 4.38 | 0.124 |
| 1945 | 40.75 | 17.12 | 5.92 | 1.008 | 6 92 | 2.91 | 4.38 | 0.127 |
| 1946 | 38.53 | 16.18 | 6.45 | 1.044 | 9.45 | 3.97 | 5.11 | 0.203 |
| 1947 Ⓟ | 40.35 | 16.95 | 8.62 | 1.461 | 9.03 | 3.79 | 7.01 | 0.266 |

| Year | Gas oil and distillate fuel oil | | | | Residual fuel oil | | | |
|---|---|---|---|---|---|---|---|---|
| | Per cent yield | Gal per bbl of charge | Price ¢ per gal (No. 2 fuel oil) | Value $ per bbl of charge | Per cent yield | Gal per bbl of charge | Price ¢ per gal (Bunker C) | Value $ per bbl of charge |
| 1928 | 11.07 | 4.65 | 4.20 | 0.195 | 28.76 | 12.08 | 1.52 | 0.184 |
| 1932 | 10.32 | 4.33 | 2.71 | 0.117 | 25.03 | 10.51 | 1.13 | 0.119 |
| 1936 | 13.74 | 5.77 | 3.46 | 0.200 | 25.91 | 10.88 | 2.17 | 0.236 |
| 1937 | 14.20 | 5.96 | 4.00 | 0.238 | 26.01 | 10.92 | 2.40 | 0.262 |
| 1938 | 15.50 | 6.51 | 4.11 | 0.268 | 23.80 | 10.00 | 1.93 | 0.193 |
| 1939 | 16.04 | 6.74 | 3.88 | 0.262 | 23.35 | 9.81 | 1.98 | 0.194 |
| 1940 | 18.06 | 7.59 | 3.81 | 0.289 | 23.08 | 9.69 | 2.14 | 0.207 |
| 1941 | 16.21 | 6.81 | 4.14 | 0.282 | 23.26 | 9.77 | 2.07 | 0.202 |
| 1942 | 19.77 | 8.30 | 4.18 | 0.347 | 24.40 | 10.25 | 2.12 | 0.217 |
| 1943 | 19.14 | 8.04 | 4.15 | 0.334 | 25.70 | 10.79 | 2.45 | 0.264 |
| 1944 | 18.28 | 7.68 | 3.88 | 0.298 | 23.28 | 9.78 | 2.43 | 0.238 |
| 1945 | 18.42 | 7.74 | 3.88 | 0.300 | 20.84 | 8.75 | 2.31 | 0.202 |
| 1946 | 20.51 | 8.61 | 4.53 | 0.390 | 19.81 | 8.32 | 3.00 | 0.250 |
| 1947 Ⓟ | 19.36 | 8.13 | 6.27 | 0.510 | 19.80 | 8.32 | 4.90 | 0.408 |

| Year | Lubricating oil | | | | Other products | | | |
|---|---|---|---|---|---|---|---|---|
| | Per cent yield | Gal per bbl of charge | Price ¢ per gal (500 vis No. 2½-3½ color) | Value $ per bbl of charge | Per cent yield | Gal per bbl of charge | Price ¢ per gal (Average) | Value $ per bbl of charge |
| 1928 | 4.60 | 1.93 | 10.58 | 0.204 | 3.20 | 1.34 | 6.369 | 0.085 |
| 1932 | 2.78 | 1.17 | 7.74 | 0.091 | 8.41 | 3.53 | 1.548 | 0.055 |
| 1936 | 2.50 | 1.05 | 8.45 | 0.089 | 7.56 | 3.18 | 1.474 | 0.047 |
| 1937 | 2.76 | 1.16 | 8.88 | 0.103 | 7.14 | 3.00 | 1.280 | 0.038 |
| 1938 | 2.46 | 1.03 | 7.92 | 0.082 | 7.71 | 3.24 | 1.152 | 0.037 |
| 1939 | 2.57 | 1.08 | 7.99 | 0.086 | 7.57 | 3.18 | 1.157 | 0.037 |
| 1940 | 2.80 | 1.18 | 8.86 | 0.105 | 8.36 | 3.51 | 1.253 | 0.044 |
| 1941 | 2.80 | 1.18 | 9.30 | 0.110 | 8.32 | 3.49 | 1.613 | 0.056 |
| 1942 | 3.22 | 1.35 | 10.00 | 0.135 | 9.52 | 4.00 | 1.819 | 0.073 |
| 1943 | 3.03 | 1.27 | 10.00 | 0.127 | 10.02 | 4.21 | 1.701 | 0.072 |
| 1944 | 2.61 | 1.10 | 10.00 | 0.110 | 9.42 | 3.96 | 1.332 | 0.053 |
| 1945 | 2.57 | 1.08 | 10.00 | 0.108 | 9.08 | 3.81 | 1.295 | 0.049 |
| 1946 | 2.87 | 1.21 | 10.62 | 0.129 | 6.89 | 2.89 | 1.676 | 0.048 |
| 1947 Ⓟ | 3.04 | 1.28 | 13.31 | 0.170 | 6.92 | 2.91 | 1.970 | 0.057 |

| Year | Total value realized | Price avg East Texas and West Texas crude oil at well | Refiners' margin | Ratio Price per bbl of crude oil to price per gal of gaso |
|---|---|---|---|---|
| | $ per bbl of charge | $ per bbl | $ per bbl of crude oil run | |
| 1928 | 2.28 | 1.05 | 1.22 | 12.1 |
| 1932 | 1.34 | 0.78 | 0.56 | 16.7 |
| 1936 | 1.59 | 0.97 | 0.62 | 19.0 |
| 1937 | 1.71 | 1.09 | 0.62 | 20.2 |
| 1938 | 1.71 | 1.07 | 0.64 | 19.3 |
| 1939 | 1.64 | 0.93 | 0.71 | 18.2 |
| 1940 | 1.60 | 0.93 | 0.68 | 19.2 |
| 1941 | 1.82 | 1.03 | 0.79 | 18.0 |
| 1942 | 1.81 | 1.09 | 0.72 | 18.5 |
| 1943 | 1.80 | 1.09 | 0.71 | 18.2 |
| 1944 | 1.77 | 1.09 | 0.68 | 18.3 |
| 1945 | 1.79 | 1.09 | 0.70 | 18.4 |
| 1936 | 2.06 | 1.28 | 0.78 | 19.8 |
| 1947 Ⓟ | 2.87 | 1.82 | 1.05 | 21.1 |

Ⓟ Preliminary.

Source: Product prices from oil companies and published sources; balance of source data from U. S. Bureau of Mines; correlations by *The Petroleum Data Book* Research Department.

*From The Petroleum Data Book, Second Edition, which carries 750 pages of information on the petroleum industry.*

# This is the Diesel

## that gave power users new ideas

SHOW an engineer a better source of power and things start happening fast.

That's illustrated by events since General Motors first introduced the "71" Series of two-, three-, four- and six-cylinder Diesel engines, ranging from 50 to 200 horsepower—little brothers of the famed two-cycle GM Diesels that drive so many crack American passenger and freight trains.

Bus engineers went for the "71" at first sight. They liked its compactness, its fuel economy, its clean-burning operation. Now more than 20,000 city and inter-city buses are powered by GM "71" Diesel engines.

Army and Navy engineers approved its rugged strength and dependability. During the war they used 182,000 GM "71" Diesels to operate landing craft, tanks, tractors, bulldozers and other military vehicles.

So, too, have designers of all types of power-driven equipment turned to the GM "71" for low-cost efficient power. Today they are using it in heavy-duty trucks, tractors and earth movers, in work and pleasure boats, in cotton gins, lumber mills, oil rigs and for many other mobile, portable and stationary uses—*with remarkably successful results!*

That is because the GM "71" is a two-cycle engine that delivers power on every piston downstroke—in contrast to most Diesels that deliver power only on every second downstroke. This makes GM Series 71 Diesels more compact, lighter, faster-accelerating, smoother, cleaner-burning—*and twelve years' experience in applications totaling over 46,000,000 horsepower proves it!*

The GM "71" gives you Diesel brawn without the bulk. *It is Diesel power at its best.*

## DETROIT DIESEL ENGINE DIVISION

SINGLE ENGINES . . . Up TO 275 H. P. **DETROIT 28, MICHIGAN** MULTIPLE UNITS . . . Up TO 800 H. P.

**GENERAL MOTORS**

***Only GM Diesels provide all these advantages***

Smaller size, less weight per horsepower • Two-cycle smoothness, power on every downstroke • Quick starting, on its own fuel • Unit injectors—no high-pressure fuel lines • Rapid acceleration • Cleaner burning • Better high-altitude performance • Easy accessibility

GM
GENERAL MOTORS
DIESEL POWER

*"Your Key to Power Economy"*

# SMALL PIPE *Threaded* IN A JIFFY

## Quick, perfect threads on 1/8" to 2" pipe with RIDGID Nos. 00R, 111R, 12R

● You get ready in a hurry with these light, strong ratchet drop-head dies—just snap in the size die head you want and you're all set for threading. Die heads can't fall out—no special dies needed for close-to-wall work. Precision-cut tool steel dies for smooth perfect threads. Ask your Supply House for work-saver RIDGIDS No. 00R, 1/8" to 1"; No. 111R, 1/8" to 1¼"; No. 12R, 1/8" to 2."

RIDGID

WORK-SAVER PIPE TOOLS

THE RIDGE TOOL CO. • ELYRIA, OHIO


# MEETINGS

Oct. 1-3—IPAA, Annual Meeting, Jefferson Hotel, St. Louis, Mo.

Oct. 2-6—AGA, Annual Convention, Atlantic City, New Jersey.

Oct. 4-5—Mid-Continent Oil and Gas Assn, Texas Division, Baker Hotel (tentative), Dallas, Texas.

Oct. 4-6—AIME, Petroleum Branch, Fall Mid-Continent Meeting, Roosevelt Hotel, New Orleans, La.

Oct. 5-6—Liquefied Petroleum Gas Assn, North Eastern District Meeting, Ambassador Hotel, Atlantic City, N. J.

Oct. 9-10—American Assn of Oilwell Drilling Contractors, Annual Meeting, The Mayo, Tulsa, Okla.

Oct. 9-10—National Association of Corrosion Engineers, South Central Regional Meeting, Rice Hotel, Houston, Texas.

Oct. 12-13—AIME, Petroleum Branch, Fall West Coast Meeting, Elks Club, Los Angeles, Calif.

Oct. 12-13—Western Petroleum Refiners Association, Regional Meeting, Gladstone Hotel, Casper, Wyoming.

Oct. 15-21—OIL PROGRESS WEEK.

Oct. 16-20—National Safety Congress, Chicago, Ill.

Oct. 18-19—National Conference, Industrial Hydraulics, Sherman Hotel, Chicago, Illinois.

Oct. 19-20—American Assn of Petroleum Geologists, Society of Economic Paleontologists and Mineralologists, and Society of Exploration Geophysicists, all Pacific Coast Sections, Ambassador Hotel, Los Angeles, Calif.

Oct. 19-22—Permian Basin Oil Show, Odessa, Texas.

Oct. 23—Independent Natural Gas Association of America, Annual Meeting, Shamrock Hotel, Houston, Texas.

Oct. 23-27—AIEE, Fall General Meeting, Skirvin Hotel and Skirvin Tower Hotel, Oklahoma City, Okla.

Oct. 23-27—National Metal Exposition, Amphitheater, Chicago, Ill.

Oct. 27—Natural Gasoline Association of America Southern Regional Meeting, Blackstone Hotel, Tyler, Texas.

Oct. 30-Nov. 1—National Lubricating Grease Institute, Annual Meeting, Edgewater Beach Hotel, Chicago, Ill.

Nov.—Mid-Continent Oil and Gas Assn, Mississippi-Alabama Division, Edwards Hotel (tentative), Jackson, Miss.

Nov.—Mid-Continent Oil and Gas Assn, Kansas-Oklahoma Division, Tulsa Club (tentative), Tulsa, Okla.

Nov. 2-3—Mid-Continent Oil and Gas Association, Louisiana-Arkansas Division, Roosevelt Hotel, New Orleans, La.

Nov. 2-3—Society of Automotive Engineers, Diesel Engine Meeting, Hotel Knickerbocker, Chicago, Ill.

Nov. 2-3—Eighth Annual Pittsburgh X-ray and Electron Diffraction Conference, Mellon Institute for Industrial Research, Pittsburgh, Pa.

Nov. 9-10—SAE, Fuels and Lubricants Meeting, The Mayo, Tulsa, Okla.

Nov. 9-10—California Natural Gasoline Assn, Annual Meeting, Ambassador Hotel, Los Angeles, Calif.

Nov. 11-13—Oil Industry Information Committee, Biltmore Hotel, Los Angeles, Calif.

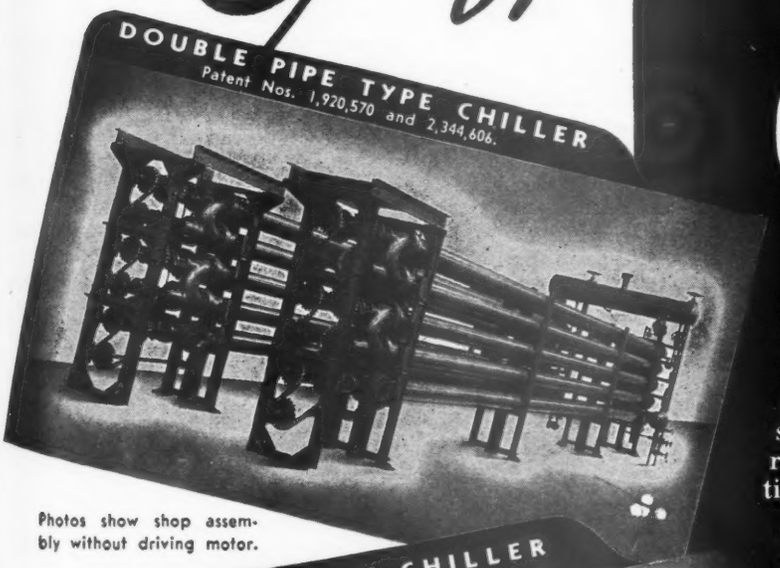
Nov. 13-14—API, Lubrication Committee, Biltmore Hotel, Los Angeles, Calif.

Nov. 13-16—API, Annual Meeting, Biltmore Hotel and Ambassador Hotel, Los Angeles, Calif.

# If you're all "gummed up" in a tough heat transfer problem Specify..

Vogt Spiral, Spring Type Scraper
Patent No. 2,117,175

# Vogt SCRAPER TYPE CHILLERS




Photos show shop assembly without driving motor.

Fouling of the inner pipe surfaces of Vogt Chillers is eliminated, because they are swept clean continuously during operation by patented spiral, spring type scrapers. And these clean surfaces achieve the highest possible rate of heat transfer between the solution and the refrigerant.

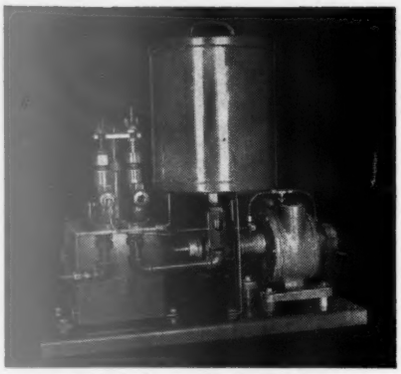
**VOGT DOUBLE PIPE TYPE CHILLERS** are designed to use ammonia, brine, or cold dewaxed oil as the cooling medium. Oil or brine, when employed, is circulated through the jacket pipes countercurrent to the flow of the solution in the inner pipes.

**MULTI-PIPE TYPE CHILLERS,** for direct expansion, have large jacket shells each containing seven inner pipe sections and employ volatile refrigerants such as ammonia, freon, propane, etc.

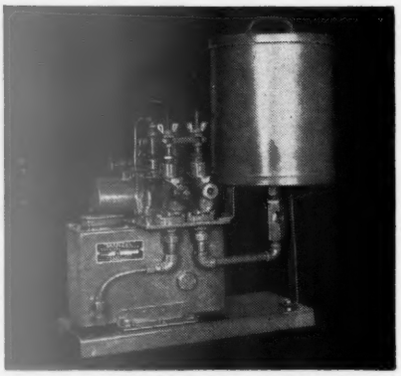
*Our engineering staff is qualified by training and experience to help you find the right answers to your heat transfer problems. Their recommendations are available without obligation.*

**HENRY VOGT MACHINE CO.**
INCORPORATED
**LOUISVILLE 10, KENTUCKY**
BRANCH OFFICES: NEW YORK, PHILADELPHIA, CLEVELAND, CHICAGO, ST. LOUIS, DALLAS

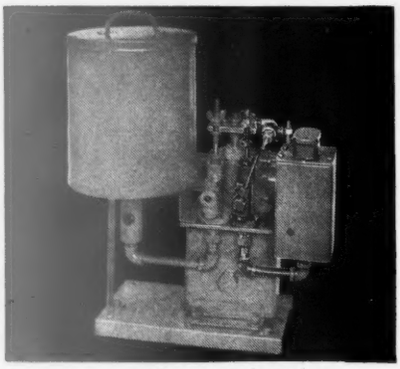
# No More *Bad Tanks* of Oil



Self Lubricating Manzel Feeder with Rotary Drive Motor



Self Lubricating Manzel Feeder with Reciprocating Drive Motor



Force Feed Lubrication Conversion Kit

## New Manzel Chemical Feeder Operates Continuously with No Extra Attention!

● Now you can be sure that chemical feeders are working steadily, preventing any possibility of bad tanks—even though they have been unattended for more than 24 hours.

These NEW Manzel Chemical Feeders have built-in force feed lubrication systems. These assure *complete* lubrication of the waste gas-driven motors, preventing the corrosion that frequently causes stoppage. They eliminate excessive manual labor formerly necessary in order to keep feeders constantly operating in wet gas fields.

The Feeders are available with Reciprocating or Rotary Drive Gas Motors, operating on as low as 3 lbs. pressure. They supply any desired amount of chemicals from 1/2 pint per hour up. Or you may obtain kits for conversion of present chemical feeders to force feed lubrication. Ask your Manzel Representative for details or write .

*Manzel*

DIVISION OF
**FRONTIER INDUSTRIES, Inc.**
291 BABCOCK STREET, BUFFALO 10, N. Y.


Nov. 27-29—American Standards Association, Waldorf-Astoria Hotel, New York, N. Y.

Nov. 26-Dec. 1—ASME, Hotel Statler, New York, N. Y.

Dec. 1-2—AIME, Texas Local Sections, Texas Technological College, Lubbock, Texas.

Dec. 3-6—AIChE, Annual Meeting, Neil House, Deshler Wallick Hotel, Columbus, Ohio.

Dec. 26-31—American Assn for the Advancement of Science, Annual Meeting, Hotel Statler, Cleveland, Ohio.

1951

Jan. 9-10—Pipe Line Contractors Association, Shamrock Hotel, Houston, Texas.

Jan. 18-20 — Second Annual Institute on Oil and Gas Law and Taxation, Southwestern Legal Foundation, Southwestern Legal Center, Dallas, Texas.

March 5-9—ASTM, Spring Meeting and Committee Week, Cincinnati, Ohio.

March 7-9—API Division of Production, Southwestern District Meeting, Hotel Beaumont, Beaumont, Texas.

March 16-18—American Society of Lubrication Engineers, Annual Convention and Lubrication Show, Bellevue-Stratford Hotel, Philadelphia, Pa.

March 21-23—API, Mid-Continent District, Herring Hotel, Amarillo, Texas.

March 23-25—Southern Gas Association, Buena Vista and Edgewater Gulf Hotels, Biloxi, Miss.

April 2-4—Western Petroleum Refiners Association, Annual Meeting, Plaza Hotel, San Antonio, Texas.

April 3-5—API, Eastern District, Deshler-Wallick Hotel, Columbus, Ohio.

April 18-20—National Petroleum Assn, Hotel Cleveland, Cleveland, Ohio.

April 19-20—API, Rocky Mountain District, Gladstone Hotel, Casper, Wyoming.

May 10-11—API Pacific Cost District, Biltmore Hotel, Los Angeles, Calif.

May 13-16—AIChE, Regional Meeting, Hotel Muehlebach, Kansas City, Mo.

May 14-16—AGA, Operating Section, Production and Chemical Conference, Hotel New Yorker, New York, N. Y.

May 28-June 6—World Petroleum Congress, The Netherlands, The Hague.

June 16-20—Canadian Gas Assn, Bigwin Inn, Lake of Bays, Ontario, Canada.

June 18-22—American Society for Testing Materials, Annual Meeting, Atlantic City, N. J.

Oct. 15-20—Oil Progress Week.

### NOMADS TO MEET

New York, N. Y., Chapter, First Monday of the Month, Louis Sherry's, New York, N. Y. Sec. Russ V. McIntire, 11 West 42nd Street, New York 18, New York.

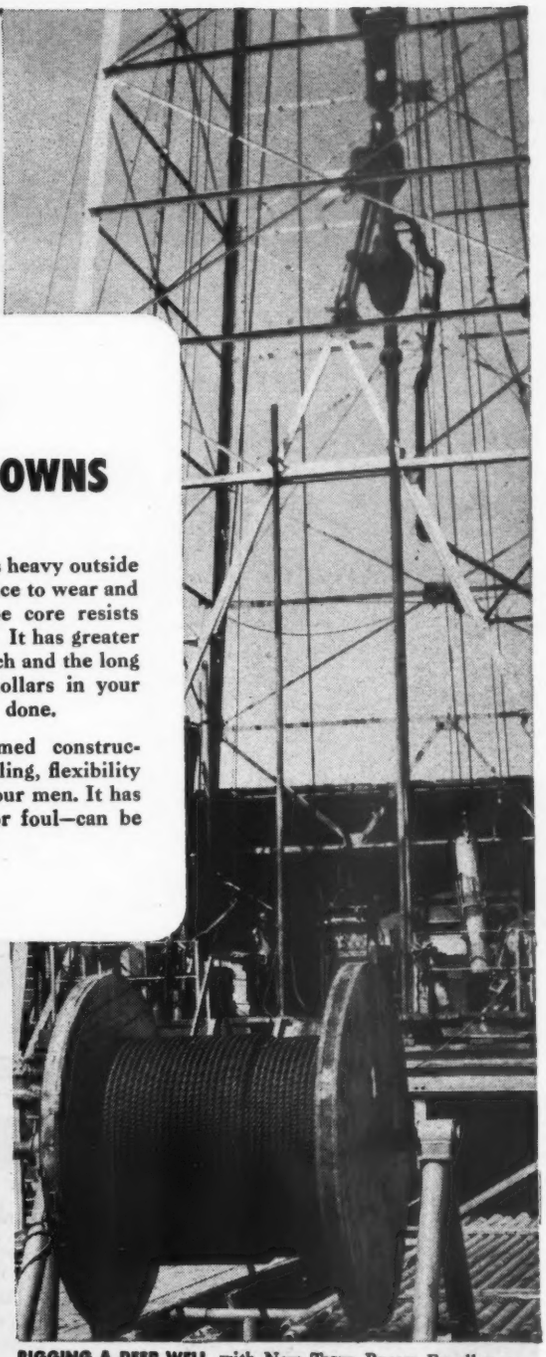
Houston Chapter, Second Monday of the Month, Ye Ole College Inn, Houston, Texas. Sec. Harry E. Estes, P. O. Box 9321, Houston 11, Texas.

Los Angeles Chapter, Second Wednesday of the Month, Jonathan Club, Los Angeles, Calif. Sec. John W. Rife, 5905 Pacific Blvd., Huntington Park, Calif.

Tulsa Chapter, Third Wednesday of the Month, Hotel Tulsa, Tulsa, Okla. Sec. G. W. Davidson, Jr., Box 1188, Tulsa, Okla.

Dallas Chapter, Dallas, Texas, First Monday of the Month. Sec. C. J. Berlin, Box 2968, Dallas, Texas.

# Judge it by the jobs it handles



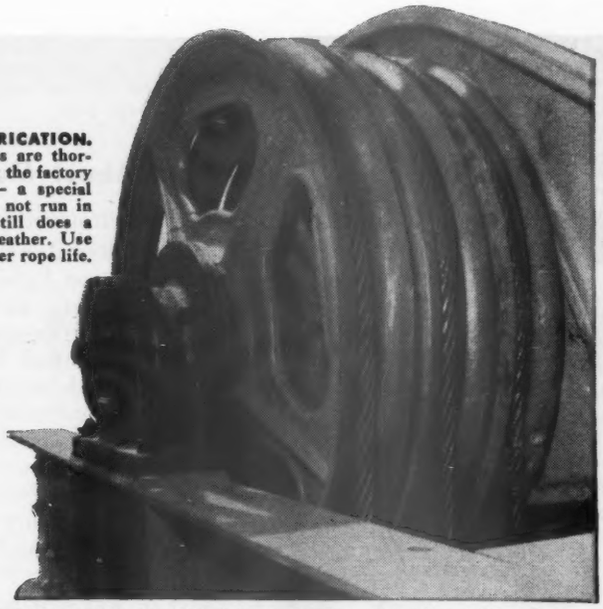
## Deep well gets rigged with Tiger Brand Line for FEWER SHUTDOWNS

WHAT does a day's loss of drilling time cost you? $1000 or more? Even the loss of a few hours runs into big money! That's why it's so important to choose the line that gives you the most ton-miles before a line shift is necessary. Many drilling contractors have discovered that this is TIGER BRAND Excellay Preformed 6 x 19 with Independent Wire Rope Core.

This TIGER BRAND Rope has demonstrated its superior performance on hundreds of wells. It has heavy outside wires for greater resistance to wear and abrasion. The wire rope core resists crushing on heavy loads. It has greater strength, minimum stretch and the long life that means more dollars in your pocket when the job is done.

TIGER BRAND Preformed construction gives you easy handling, flexibility and greater safety for your men. It has less tendency to kink or foul—can be run at higher speeds.

**WATCH YOUR LUBRICATION.** TIGER BRAND Ropes are thoroughly lubricated at the factory with Tiger Lube — a special lubricant that does not run in hot weather and still does a good job in cold weather. Use Tiger Lube for longer rope life.



**RIGGING A DEEP WELL** with New TIGER BRAND Excellay Preformed Line with I.W.R.C. for more ton-miles and fewer shut-downs.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA STEEL COMPANY, SAN FRANCISCO
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

# AMERICAN TIGER BRAND WIRE ROPE

USS TRADE MARK *Excellay Preformed*

USS AMERICAN TIGER BRAND WIRE ROPE UNITED STATES STEEL

***SEND THE COUPON FOR OUR HANDBOOK.***

American Steel & Wire Company
Rockefeller Bldg., Dept. T-100
Cleveland, Ohio

Please send your handbook, "TIGER BRAND Wire Rope for Oil, Gas and Water Wells."

Name.....

Address.....

City..... State.....

UNITED STATES STEEL

# LETTERS TO THE EDITORS

## Drilling Muds

*To The Petroleum Engineer:*

I have an article on Silicate Drilling Fluids by C. C. Pryor, which appeared in *The Petroleum Engineer* of June, 1943; but I have no recent literature on the subject. As we are anxious to obtain as much information as we can about modern developments in the Silicate Mud technique, I wondered if you would be good enough to put me on to somebody who might be able to give me the help I need.

What I am particularly keen to know is whether any method has been found yet of reducing filter loss and filter cake to reasonable dimensions, the presently recommended formula for mixing a suitable mud, and expected maintenance costs.

*D. S. Gibson*

Field Chemist
Trinidad Petroleum
Development Company, Ltd.
Trinidad, B.W.I.

**Editor's Note:** Several new types of drilling muds have come into use since 1943, when sodium silicate was used in some instances to reduce water loss and filter cake thickness. Carboxymethylcellulose (CMC, or "Driscose") is used frequently in sodium clay, lime base, or emulsion types drilling muds to control water loss and filter cake thickness. Commercial starch is also used in such muds for the same purpose.

A drilling mud suitable for adequate control in one area may not be suitable in another area, particularly if the formations drilled are not similar. Likewise, mixing and mud maintenance costs in one area are seldom comparable with costs in another area, particularly if the mud materials cost more or less to obtain at the well.

Tear sheets of some recent articles on drilling muds sent to writer to aid in determining what kind of mud to use, included the following, all from *The Petroleum Engineer*:

"Evaluating Native Clays for Use as Drilling Muds," V. B. Zacher, April, 1950, B-50.

"A Discussion of Mud Fundamentals," Richard Sneddon, January, 1950, B-57.

"Chemistry and Control of Lime Base Drilling Muds," Arthur W. McCray, November, 1949, B-54.

"Structure and Chemical Control of Drilling Muds," A. W. McCray, October, 1949, B-45.

"Drilling Mud Programs for West Texas Wells," C. W. Scamman, June, 1949, B-13.

"Use of Oil Base Mud to Free Stuck Pipe," June, 1949, B-54.

## More About Mud

*To The Petroleum Engineer:*

The editorial written by K. Marshall Fagin on Page B-3 of your August 1950 issue was noteworthy because of the fact that you recognize one of the often unrecognized advances in modern drilling.

As you know mud has gone through a tremendous transition from a period in which it was merely a "slop" used to suspend cuttings and sand in cable-tool and early rotary work to the present where it is a highly complex drilling or completion fluid, the responsibility of which is actually the oilwell itself.

It is hoped that more writers will recognize, as you do, the really important function of drilling mud.

*Vernon B. Zacher*

Chairman, Pacific Coast District
Subcommittee on Drilling Fluids
American Petroleum Institute

☆ ☆ ☆

**Horse Makes Ideal Gas Sniffer.** An 8-year-old Palomino is owned by Horace Hull, a Cities Service pipe line walker in Kansas. Hull and Laddie follow the line and the horse sniffs leaks better than his master, says Hull.

ARCCO
ARCCO ANUBIS
LIQUID GRAVITOMETER
...for PIPELINES, REFINERIES, GASOLINE PLANTS
This ruggedly built instrument of laboratory accuracy is ideal for quick checking and for continuous recording of Specific Gravity of liquids under line pressure. Changes in Specific Gravity of sample are recorded with a very minimum of time lag. Foreign liquids and gases are automatically purged from sample. No moving joints or stuffing boxes to cause friction or leakage. Temperature corrected, this precision instrument is adaptable to high pressures. Hundreds are in daily use in plants and refineries of major companies. Also available as a controlling instrument. Send for bulletin No. 111A.
AMERICAN
RECORDING CHART CO.
3113 E. 11th St. • Los Angeles 23, Calif.
Available for Early Delivery
SEND FOR BULLETIN No. 111-A

The Petroleum Engineer
OCTOBER, 1950
FOREIGN ISSUE

Creole Petroleum Corporation photo
Night view of the pipe still of Creole Petroleum Corporation's new 60,000-bbl refinery at Amuay Bay, Venezuela.

P 100.

# Round Up of World Oil Activities

*The industry in 1949-50 faced everything from over-supply to record demand yet managed to develop important resources in friendly lands.*

ERNESTINE ADAMS*

In 1949-1950, July to July, the world oil industry has seen a gamut of tremendous events. It has experienced an over-supply that developed American-English disputes on world markets, that agitated the case over imports between the Independent Petroleum Association of America and the overseas operators, that brought worried Venezuelan diplomats to Washington on its country's cut in imports, that compelled Economic Cooperative Administration to cut funds for refining facilities in Europe, that brought the end of rationing in the United Kingdom, Australia, New Zealand, and, recently, South Africa.

At the end of this period most of these problems were dissolved in the black cloud of war and rising consumption. They gave way to an intensified search for more oil resources.

Time cures everything; but seldom has time worked so fast.

Some great movements were going ahead while the smoke of politico-economic disagreements filled the air. Most of these prove all over again that the capitalist-profit system finds oil if it's there.

The spectacular development of our northern neighbor, Canada, is one case in point. Scores of U. S. companies have gone into the area since Imperial Oil Company (Jersey Standard) opened Leduc. When distribution facilities are worked out Canada will have sufficient oil for her needs for the first time in history. Canadian

*Managing Editor.

EXCLUSIVE

oil also provides a new and valuable strategic material in these times of world tension.

Our neighbor Mexico to the South checked up and decided to inject enough profit motive into oil production to re-attract those capitalists who apparently find more oil than the government. So some U. S. companies went in and the Mexican American Oil company, made up of some dozen independents, discovered a lucrative new field on its first try—which isn't all luck.

On the opposite side exploration and production was static in countries where governmental controls shut out private enterprise. A few Latin American republics had made regulations too tough for even the most optimistic private company. Egypt had virtually closed out foreign capital by her new oil laws. From the slightly authentic news from behind the iron curtain Russia had scarcely improved her oil position and her satellites were apparently worse off than in the past. They were certainly worse off in that Russia took a big share of the production and there was some evidence that even the production was down.

There was one report that Russia sent Albania rigs that would drill to 5000 ft but her pools were below 6000 ft. Geology must be made to fit the equipment in this exploration for oil by edict, which is no more amazing than the trick of making the crime fit the punishment.

In Latin America a small beginning has been made in explaining the oil industry to the public. This is overdue. Rich oil companies have been the target of the demagogues there as here. It seems simple enough that if they weren't "rich" they could hardly spend millions of dollars in possible oil areas, but mere arithmetic is not enough as the oil industry is finding out. One company has begun by running a series of ads on information about its operation. A Colombian consultant has suggested that all the Latin American operators combine to provide information to the public on the order of the API Oil Industry Information Committee.

One of the significant moves of the year was the vast expansion of Western Europe and the United Kingdom refining capacity with the aid of ECA financing, which amounted to $29,917,000 to June 30, or 16 per cent out of $185,834,000 spent for construction. This almost doubled the capacity in operation at the beginning of the ECA program, putting it back to prewar levels.

There was protest from the U. S. oil industry that the program was too large. France had more capacity than was used last year. So did we for that matter. In the United Kingdom refining expansion was its largest industrial growth, reaching 90,000,000 bbl in 1950 from 39,000,000 in 1949 and expected to go to 128,000,000 bbl yearly at the end of 1952. This is another event that awaits the verdict of time but with consumption rising and the state of political tension, over-expansion seems more unlikely now than it did a few months ago.

The impasse here could come when various laws of oil-producing countries requiring refining facilities in proportion to production are complied with. We could arrive at the point where we have more refining capacity than production potential.

Even before the Korean catastrophe consumption was rising. With the event of war, demand spurted ahead. British and American companies cut off supplies to Red China. The U. S. tightened controls on petroleum products to the USSR. Demand elsewhere rose and is still rising. The flexibility of the oil industry was shown in its instant supply of the demand. It went from the problems of over-supply to record demand within a few months, until world production in August reached 10,662,370 bbl a day. There were no dislocations or shortages of importance. The oil industry is working smoothly.

Happenings of the oil industry throughout the world in 1949-50 are reviewed in the following alphabetically listed countries.

### ADEN

The oil field discovered in this British Protectorate on the south tip of the Arabian Peninsula is said to be a rich one. It has caused new disputes with Yemen over the boundary and Anglo-Arab tension.

### ALASKA

During 1949 the Navy has continued its search for oil in Naval Petroleum Reserve No. 4 in Arctic Alaska. Geological and geophysical surveying of the area were continued as were test well and core hole drilling for geological and paleontological information in areas where surface exposures of underlying rocks are not observable, according to Commodore W. G. Greenman, U. S. Navy, director of Naval Petroleum Reserves. Pior to January, 1950, the Navy drilled 7 test wells and 30 core holes in the Reserve. During the coming year plans call for the continued use of 3 rotary strings and one shallow cable tool hole rig and the completion of 7 additional wells. Present plans call for completion of all work by December 31, 1952.

Union Oil Company and Ohio Oil Company had two field parties in Alaska conducting geological studies.

### ALBANIA

**Prod. 5700 B/D (?) Ref. Cap. 750 B/D**

Daily production of 5700 bbl reported from this Iron Curtain country is the highest ever made from its few small fields; 1 to 5 times the annual output reported in other years since the war. Last year it was an estimated 900 bbl a day.

### ALGERIA

Accelerated drilling program has given encouragement. ECA has approved funds for use by S. N. Repal, a French-Algerian firm, in its search for oil. (See France.)

### ARGENTINA

**Prod. 62,000 B/D Ref. Cap. 130,000 B/D**

Slight improvement in production is reported for Yacimientos Petroliferos Fiscales, government-owned company and largest in the nation. One new oil sand was found at 7500 ft in Punta Piedras field. Initial production of the discovery well was reported to be 600 bbl a day. Production was reported to have gone down to as low as 56,000 bbl a day and is now turning toward last year's 63,000 bbl a day average. Private companies (Jersey Standard and Shell) can drill only on concessions granted 25 years ago. They have held their output steady with development wells.

The 1000-mile 10-in. gas line from Comodoro Rivadavia (UPF field) to Buenos Aires is completed and in operation.

To fill demand Argentina made a trade pact with Great Britain to exchange meat for oil. One drawback to this is lack of range of crude oil and refineries not prepared to handle the Middle East crude oil have to convert or shut down. Refinery runs are only some 100,000 bbl a day.

### AUSTRALIA

**Ref. Cap. 18,000 B/D**

With all its effort toward that objective Australia has not yet found commercial production. Refinery runs in the country's plants are about 10,000 bbl a day, considerably less than capacity.

### AUSTRIA

**Prod. 20,000 B/D Ref. Cap. 25,000 B/D**

Under the proposed Austrian peace treaty as now written Russia will get 60 per cent of the production and of explorable lands, 420,000 tons of refining capacity. Socony Vacuum and Shell, former operators in the country, will probably get what is left, if the remainder is still functioning. Production is a guess, probably no higher than 20,000 bbl a day. This means another 5000 bbl must be imported daily if refineries are kept at capacity. The Austrian government protested that Russia is depleting the country's reserves.

### BAHAMAS

All operating companies other than Anglo-Bahamian Petroleum Company Ltd. and Standard Oil Company (Bahamas), Ltd. renewed their exploration licenses for 1950, and part of the area relinquished by Anglo-Bahamian Petroleum Company, Ltd. was reallocated to Bahamas Exploration Company (Gulf), according to the Colonial Secretary's office. Little or no field work has been done during 1950 but all companies are still engaged in interpreting the results of surveys previously carried out. The resident geologist of the Bahamas Exploration Company Ltd. is making a study of the submarine geology in some of the areas.

### BAHREIN

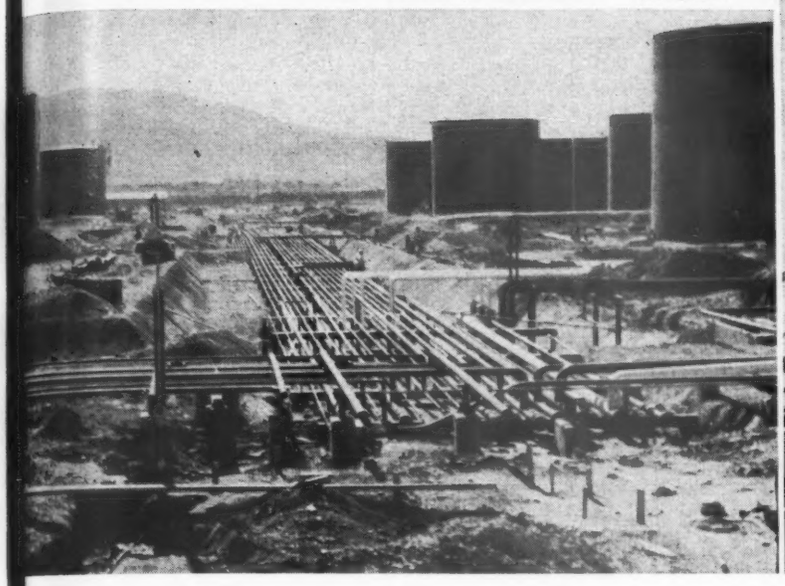
**Prod. 30,000 B/D Ref. Cap. 165,000 B/D**

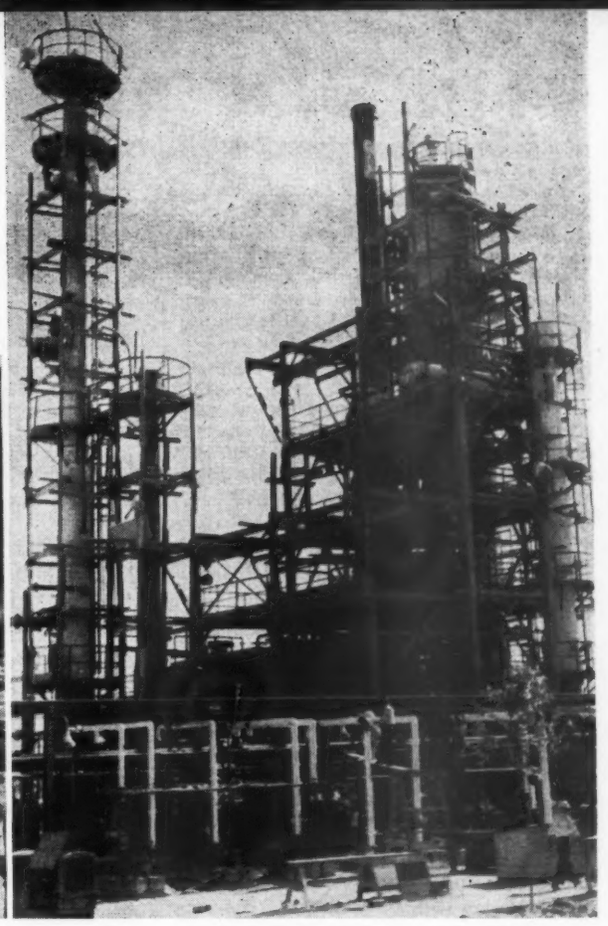
The Bahrein Petroleum Company (Caltex) is operating two drilling strings on Bahrein Island; one is engaged in normal development and replacement well drilling to the Bahrein zone where depth of wells is in the neighborhood of 2500 ft, and the other is engaged in deep test drilling in the

Crude unit as seen from northeast side.

Looking north down east pipe alley.

BOLIVIA REFINERY YPFB photos





Bahrein field. Drilling here is presently progressing at below 10,000 ft. Production from the field continues at 30,000 bbl a day and is maintained at this rate by pressure maintenance by gas injection to an artificially created gas cap.

### BELGIUM

**Ref. Cap. 16,500 B/D**

Construction is under way on the 30,000 bbl refinery at Antwerp for Soc. Industrielle Belge des Petroles (Anglo-Iranian and Petrofina). M. W. Kellogg Company has the contract. Completion is expected in July 1951. This will double Belgium's refining capacity. Refinery runs in 1949 were only 8000 bbl a day.

### BOLIVIA

**Prod. 2000 B/D Ref. Cap. 2790 B/D**

From July 1, 1949 to June 30, 1950, Yacimientos Petroliferos Fiscales Bolivianos drilled 3440 meters, having completed the drilling of 2 wells. During said period the production of petroleum reached 111,997 cubic meters. Bolivia has three fields, the most important being Camiri.

In August, the 6-in. pipe line between Camiri and Cochabamba and the 4-in. Lamboyo branch Sucre line, with a total extension of 371 miles, was officially inaugurated. It was constructed by Williams Brothers Company, Tulsa.

During the same month a topping plant entered into operation for 1000 bbl daily, constructed by Foster Wheeler Corporation. In Cochabamba construction has begun on a topping reforming plant, for a daily processing capacity of 5000 bbl. It is estimated that it will be completed by the end of the current year.

### BORNEO, BRITISH

**Prod. 80,000 B/D Ref. Cap. 35,000 B/D**

Brunei and Sarawak production is increasing steadily, averaging 70.000 bbl a day in 1945 and now up to 80,000 bbl daily. This includes output of Seria field, British Malayan Petroleum Company, Ltd., and the 1100 bbl daily from Miri field, Sarawak Oilfields, Ltd. The latter's refinery at Lutong has a 35,000-bbl capacity.

### BORNEO, N.E.I.

**Prod. 17,500 B/D Ref. Cap. 9000 B/D**

The old fields here have stood up well under war destruction and rehabilitation. Such fields as Sanga Sanga, discovered in 1897, Anggana-Moeara, in 1902, and Tarakan, in 1906, produced about the same this year as last with little drilling—only 7 wells in all three. There is some decline, however. The Shell refinery at Balik Papan is processing about 9000 bbl a day.

### BRAZIL

**Prod. 450 B/D Ref. Cap. 3700 B/D**

Production and refining capacity remain virtually unchanged. Plans for new and expanded plants are the important item in Brazil's program. Construction of the 45,000 bbl a day government plant for Cubatao will begin this fall. Hydrocarbon Research has the contract. M. W. Kellogg Company is enlarging another government plant at Mataripe to 2500 bbl a day. Two other refineries are planned for Sao Paulo and for Rio de Janeiro.

Drilling began in July on a wildcat in the State of Para. This venture in the Amazon Basin is the result of studies by DeGolyer & MacNaughton and of Geophysical Service. Discovery of oil at Pedras was reported in June.

### BRUNEI

(See British Borneo)

### BURMA

**Prod. 500 B/D Ref. Cap. 1800 B/D**

Insurgents have destroyed equipment and sometimes petroleum stocks of the British companies in Burma. Production has gone from 21,500 bbl a day in 1939 to less than 1000 bbl in 1949. Refining is reduced to about 500 bbl a day processed at Chauk topping plant. Restrictions set by the new independent government virtually closes the industry to private concerns.

### CANADA

**Prod. 85,000 B/D Ref. Cap. 340,000 B/D**

Since the discovery of the Leduc field in 1947 by Imperial Oil, Canadian reserves have grown from 72 million barrels to 1 to 3 billion barrels. Until greater production is permitted by expanding distribution facilities, it will be difficult to judge just how large deposits are. Production in 1949 was 21 million barrels, about double any other year. This barely gives an idea of the country's potential. Outside of the U. S. and Venezuela, Canada had the largest drilling program. Here are what some of the scores of companies in Canada did during the last year:

*British American* let a contract to Canadian Kellogg Company for a refinery of 5500 bbl daily capacity at Edmonton. A pipe line is planned to bring crude oil from Redwater field.

*The California Standard Company* (Standard of California subsidiary) is carrying on an active exploration program in western Canada. Three wildcat wells have been drilled this year, one of which resulted in a gas discovery. Geophysical operations are being carried on by 5 to 7 crews, and the company has participated in the lease sales of Crown Reservation Lands. Production has averaged around 1200 bbl per day.

*Imperial Oil, Ltd.* The largest operator in Canada, is constructing a plant near Winnipeg, which will handle 10,000 bbl a day of crude oil. This will bring the company's daily crude capacity to 176,000 bbl a day.

*McColl-Fontenac Oil* has in construction at Edmonton a plant to be completed next year.

*Phillips*, together with its wholly owned subsidiary companies, holds interests in exploration rights on 6,427,233 acres in the Provinces of British Columbia, Alberta, and Saskatchewan, Canada. Phillips also holds interests in oil and gas leases covering 241,155 acres. The company is participating in the drilling of 5 exploratory wells in British Columbia and Alberta.

*Shell Oil of B. C.* is expanding its Mon-

treal East refinery from 15,000 to 25,000 bbl capacity.

*Socony Vacuum* during the year ending July 31, 1950, drilled 4 wells for company account that were found dry. In addition the company participated in the drilling of 3 joint-operation wells and 3 farmouts, all but one of which proved dry and were abandoned. The one exception, Royalite-Pekisko No. 1, a farmout, encountered oil shows in the Madison formation, but has not yet completed testing.

During the year widespread seismic, geologic surface, and gravity surveys were carried out on some 4,500,000 acres of company controlled acreage ranging from localities near the International Boundary to as far north as Utikama Lake, Lat. 56°. The company also participated in airborne magnetometer surveys, which extended north westward to near the Alberta-British Columbia-Northwest Territory boundaries.

*The Union Oil Company of California* has established a division office in Calgary and has carried on extensive land acquisition and exploration activity under the direction of Earl B. Noble. Most of the operations in Canada have been conducted as joint ventures with other Canadian and American operators, such as British-American Oil Producing Company, Hudson's Bay Company, Sunray Oil Company, Honolulu Oil Corporation, Imperial Oil Company, and Seaboard Oil Corporation. To date, approximately 2,500,000 acres have been acquired in joint leases with the above operators.

An exploratory well near Picardville in Alberta was completed during 1949 on an Imperial Oil Company acreage block. A well was completed for an estimated 26,000,000 cu ft per day of gas and at present is shut in. Further developments are suspended awaiting a market.

### CHILE

**Prod. 2000 B/D Ref. Cap. 350 B/D**

Corporacion de Fomento de la Producion began commercial production of its Tierra del Feugo field, the world's most southern field. A 43-mile line to the sea was built and two 80,000-bbl tanks (Chicago Bridge and Iron Company) were set up on the coast. First oil export was made in February and 750,000 bbl are to be shipped to Uruguay this year. Production is running about 2000 bbl a day. Plans have been worked out for more drilling, for a $2,000,000 gasoline plant and a crude stabilization plant. All operations are in the hands of the government-owned company.

### CHINA

**Prod. 2000 B/D Ref. Cap. 17,000 B/D**

The Bureau of Mines reports 752,000 bbl oil production for China in 1949. This is a rise from 1948. The fields are now in Communist hands and a Russo-Chinese Oil Company was formed to search for oil in Sinkiang, of which half the production is to go to Russia.

American and British companies agreed not to sell oil to Communist China after the outbreak of Korean hostilities.

### COLOMBIA

**Prod. 85,000 B/D Ref. Cap. 30,800 B/D**

Termination of the Tropical Oil Company's (Standard Jersey) de Mares concession after a 30-year contract was the outstanding event this year. The largest producing area in the country reverted to the government, including all facilities such as the 30,000-bbl Barranca refinery. The concession was taken over by a new company, Empresa Nacional de Petroleos, owned 55 per cent by private citizens and the balance by the government.

Earlier proposals to relax oppressive tax laws that drove out private capital brought no action but the government had to make more realistic terms with its own citizens to handle operation of de Mares.

Shell has drilled 20 wells in Casabe and improved production there and at El Difficil.

During the year ending June 30, 1950 the Colombian Petroleum Company (Socony-Vacuum) in the Barco concession completed 41 wells and had 4 wells drilling at the end of the year. Thirty-six wells were completed in the Tertiary formation of which 24 came in flowing, 10 required pumping, and 2 were non-producers. Five wells were completed in the Cretaceous, all of which flowed naturally. Total footage drilled for the year was 180,437.

All wells except one were designed for an orderly exploitation of the Tertiary and Cretaceous productive zones in the Tibu area. The exception is the Sardinata Norte No. 2 wildcat well, which was spudded March 31 and was drilling below 8029 ft on June 30. Sardinata Norte No. 1 was completed January 1942 as a dry hole at a depth of 5005 ft in the top of the Mito Juan formation. The present well is a Cretaceous test. Production from the Petrolea and the Tibu fields for the year averaged 24,920 bbl per day. Colpet operates a small refinery at Petrolea, which has a capacity of 800 bbl of crude per operating day.

A stepout well in Socony's Cantagallo field, Cantagallo No. 12, spudded on June 8, 1949, was completed on September 14, 1949 for an initial production of 1234 bbl a day of 20.4 gravity oil on a ½-in. choke.

Paturia No. 1, spudded January 25, 1949 as a joint operation of Socony-Vacuum and Shell, encountered mechanical difficulty after drilling to 9200 ft in the Cretaceous and was abandoned on September 5, 1949. There were no significant oil shows.

The first find in 3 years was the Tetuan No. 1 wildcat of Texas Petroleum Company, which discovered commercial quantities of 20 gravity oil from a plugged-back depth of 2696 ft. This well is located in the Department of Tolima in the upper Magdalena Valley. Tetuana No. 2, a step-out, was also successful, and Tetuan No. 3 is currently drilling below 2700 ft. Other structures in the same general area are being prepared for testing. This field is shut-in.

In the Velasquez field, well No. 7 was abandoned at 8300 ft, and well No. 8 completed as a producer from around 7000 ft, making 4 producing wells. Other locations are being prepared. This field was producing around 1000 bbl per day prior to completion of well No. 8.

In the coastal area, Salamanca No. 1 wildcat reached 7753 ft and is preparing to test.

Williams Brothers have a contract to lay a 120-mile products pipe line from Puerto Salgar to Bagola with a 7000 bbl capacity. Also authorized is a line from Puerto Salgar to Manizales and a 73-mile products line from the Pacific port of Buenventura to Cali.

### CUBA

**Prod. 450 B/D Ref. Cap. 6000 B/D**

Most of Cuba's production comes from Jarahueca field, which runs 430 bbl a day. Recently there has been renewed exploration activity with Gulf continuing to drill a test offshore on the north.

### CURACAO

See Netherlands West Indies

### CYPRUS

Prospectors, Ltd., a local firm, has been drilling in the region near Limassol with American equipment recently acquired. Cyprus has had several geological surveys for oil prospects without giving much encouragement.

### DENMARK

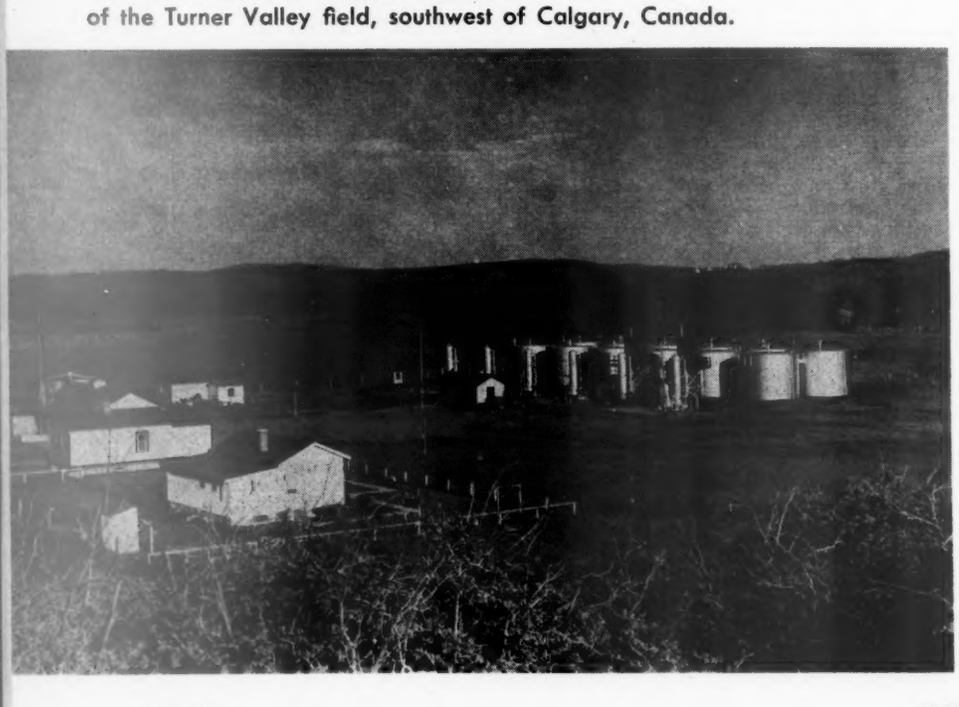
The Danish American prospecting Company (Gulf) suspended its test, No. 1 Gassum at 9955 ft but expects to resume drilling and go to 12,000 ft if possible. This is the last of 3 wells drilled under an exploratory concession. The first one under a new agreement spudded in July in northern Jutland.

### ECUADOR

**Prod. 7500 B/D Ref. Cap. 5400 B/D**

Anglo-Ecuadorian Oilfields, Ltd. continues to develop the Ancon area on the Santa Elena Peninsula, including particularly the San Tomas pool of comparatively

Separator and tank battery installation in the north part of the Turner Valley field, southwest of Calgary, Canada.



Portable 2-diesel engine rig operating in the Simmons area of the active Redwater field, Alberta. Wells in this area are about 3200 ft deep.

shallow wells southeast of the main field. Production has risen to 5500 bbl a day from this area. Several companies have concessions from the Ecuadorian government and are doing exploratory work. Concession terms are more equitable than in some South American countries but difficulties arise in getting over the jungle-covered terrain. Shell and Jersey Standard spent some $40,000,000 in 12 years before forfeiting their concession.

The Anglo-Ecuadorian refinery at La Libertad has a present intake of 4800 bbl a day. The only other plant, that of Ecuador Oilfields at Cautivo, has a capacity of only 582 bbl a day.

### EGYPT

**Prod. 42,000 B/D Ref. Cap. 46,000 B/D**

Due to the two fairly new fields owned by Shell and Socony on the Sinai Peninsula, Egyptian production has increased. Sudr, found in 1946, and Asl, in 1948, provide the increase. The latter is producing 9800 bbl daily.

Recent moves to bring the oil industry more completely under government control have discouraged exploration although development of present fields is continuing. An all Egyptian company has been granted a 267,000 acre concession on the Gulf of Suez coast and the Sinai Peninsula.

Present production is more than refining capacity but the new law requires that the government have a controlling interest in all new plants. Shell has a throughput of 38,000 bbl at its Suez refinery and the government plant, also at Suez, will have 21,000 bbl capacity when completed. Lummus Company is expanding the latter.

### ETHIOPIA

On April 14, 1950 Sinclair announced the abandonment of its well No. 1 Gumburo in the Ogaden area of Ethiopia. The drilling was suspended after reaching a depth of more than 10,000 ft. The company is proceeding with an extensive geophysical program, augmented by surface geological studies and a magnetometer survey. A new drilling location is sought.

### FORMOSA

**Prod. 70 B/D Ref. Cap. 18,000 B/D**

Most of the crude for the Kaohsiueng refinery, the only refinery on the island east of China, is brought from the Middle East. The small oil fields have declined and production probably does not run more than 70 bbl a day.

### FRANCE

**Prod. 2400 B/D Ref. Cap. 300,000 B/D**

In 1949 oil exploration was still essentially concentrated in the Aquitaine and Languedoc basins, where 25 rigs, from light to heavy, were continually in service, reports Ministère de L' Industrie et du Commerce, Bureau de Recherches de Pétrole.

Serious hopes came to encourage the search for oil undertaken in these regions. For instance, in 1949 a positive test was obtained in Coulobres (Herault) on a geophysic anomaly near the Gabian formation. At the end of the year, a first boring, undertaken on the seismic structure of Lacq proved the oil possibilities of this region and gave a regular production, restricted to 65 bbl per day, after a series of positive tests. Since then two other tests confirmed the existence of an oil deposit situated at the depth of 2100 ft. The production amounted there to 1500 bbl a day for the first months of 1950.

Besides, during the first deep drilling undertaken in 1949 in Basse Alsace, a well blew in, accelerating the exploration that had just begun in this region. During the second half 1949 five medium size rigs were allocated for developing the field newly discovered in Soultz. In the same time the concession company continued to exploit the formerly known deposits. Its production was at very nearly the same level regularly attained before the destruction and the war occupation.

In short, during 1949, about 100 exploratory tests were drilled in the basins of France. Among them 10 attained at least the depth of 8000 ft. The total drilling amounted to 115,000 ft in the Aquitaine basin, to 45,000 ft in the Languedoc basin, and to 130,000 ft in the Alsace basin (here about 15,000 ft for the wildcat wells).

In the same time, the production in the national fields was in a constant rise, amounting to 8,450,000,000 cu ft of natural gas, and 420,000 bbl of oil, with 16,500 bbl of liquid products from the natural gasoline plant in Saint-Marcet. This last production corresponds to an increase of about 50 per cent compared to the results of 1948. This was obtained on one side by the development of the production of natural gas and on the other side by the improvement of the gasoline recovery after the opening in March 1949 of the gasoline plant of Boussens (40,000,000 cu ft day capacity).

The refineries received in the calendar year 1949 87,920,000 bbl of crude which is considerably under the 107,000,000 bbl capacity of refineries. The crude oil came from:

| | |
|---|---|
| Iraq | 11,970,000 bbl |
| Middle East | 59,330,000 bbl |
| U.S.A. | 500,000 bbl |
| South America | 15,700,000 bbl |
| France | 420,000 bbl |

Capacity of the 13 refineries in service January 1, 1950 was 105,000,000 bbl yearly.

The refineries delivered:

| | |
|---|---|
| Gasolines | 22,000,000 bbl |
| Oils | 2,500,000 bbl |
| Gas oil | 13,250,000 bbl |
| Fuel oil | 35,250,000 bbl |
| Asphalts | 3,150,000 bbl |
| Lubricating oils | 1,450,000 bbl |
| Others | 400,000 bbl |
| Wax | 7,200 tons |
| Liquefied gases | 79,000 tons |

Besides the annual production of national fuels was the following:

| | |
|---|---|
| Natural gasoline | 104,000 bbl |
| Crude Oil | 420,000 bbl |
| Shale oil products | 145,000 bbl |
| Synthetic products | 35,000 bbl |

The work to equip and to improve the plants was continued. Four companies undertook the construction of modern installation for the refining of lubricating oils and the distillation of crude oil. Numerous were the refineries that enlarged their storage capacity and their terminal and transport capacity, by water and railway. Most companies also reinforced their auxiliary installations (water, energy, vapor).

Expansion continued in 1950 and plans for 1951 include expansion as well as modernization.

In Algeria since 1949, the National Society for Exploration and Development of Petroleum (S. N. REPAL) has continued its work of exploration in Algerian territory and in the northern part of the Sahara.

On the plains of the Chelif, three rigs drilled about 21,000 meters (69,000 ft approximately) for the year ending June 30. In the Aumale Region (Province of Alger), 18 shallow wells were drilled in the Oued Gueterini structure to determine the limits of the field. The first production tests gave about 15,000 liters daily (4000 U. S. gal approximately).

Geophysical studies of the Chelif Plains is done by seismic and telluric methods. Studies in the Hodna Basin and in the northern Sahara area were begun with both seismic and gravimetric methods.

### FRENCH EQUITORIAL AFRICA

Soc. des Petroles de l'Afrique Equitoriale Francaise continues its exploratory drilling in this district.

*Regie Autonome des Petroles photo by Yan*

**An excellent view of the layout at Saint Marcet Well No. 21.**

### GERMANY

**Prod. 25,000 B/D Ref. Cap. 70,000 B/D**

In the year ending 30th June 1950 drilling activity was intensified, the meterage drilled being 42 per cent over that of the previous year, the Oil Branch, Hamburg, reports.

New fields were discovered at Elpersbuttel (Schleswig-Holstein), Hohenhorn (near Hamburg), Eldingen, Kuhlenberg, Suderbruch, and Quackenbruck (Niedersachsen), and Ruhlertwist, Ruhlermoor, and Scheerhorn (Emsland). The crude produced at Quackenbruck is paraffin base.

Total production during fiscal year was 37 per cent over that of the previous year, but in the Emsland district of Niedersachsen production exceeded fiscal year 1949 figures by 85 per cent. Shell Harburg refinery, which was badly damaged during the war, was officially reopened in November 1949; its throughput will be approximately 420,000 tons per year. Bergius plant at Gelsenberg, which was shut down in 1949, began operations early in 1950 for the hydrogenation of crude oil.

OEEC, Paris, has approved the construction of new cracking plants at 5 German refineries with a total capacity of 1,000,000 tons per annum.

Deutsche Vacuum A.G., the German subsidiary of Socony-Vacuum has been active during the past year in both development and exploration. Highlight of Deutsche Vacuum's activities has been the discovery of oil in the Quakenbruck south anticline adjoining southern Oldenburg, Northwest Germany. The discovery well, Quakenbruck No. 5, was brought in in February of this year, flowing about 160 bbl a day from around 1500 to 1900 ft. Since then 5 other producing wells have been drilled. The nature of the reservoir and waxing difficulties have posed production problems in this field. The limits of the field are still being explored.

In the Hannover basin, Deutsche Vacuum continued deep drilling exploration of the Suderbruch field, discovered last year. Suderbruch now has 4 producing wells. Deutsche Vacuum has also drilled or is drilling a number of wildcats in widely scattered parts of Germany.

### GREECE

ECA, which has advanced oil operations in several countries, has agreed to aid the Greece government in an exploratory program for petroleum.

### HAWAIIAN ISLANDS

Pacific Refiners, Ltd. have almost completed a 3000-bbl a day plant at Honolulu.

### HUNGARY

**Prod. 9000 B/D Ref. Cap. 23,000 B/D**

Besides war damages Standard Jersey evaluated Moort, Hungarian Oil company taken over by Communists, at $50,000,000. Shell's refinery at Czepel has been nationalized. Seven rigs are operating and production is thought to be steady, but no new fields have been announced.

### INDIA

**Prod. 5000 B/D Ref. Cap. 5500 B/D**

Burmah Oil's subsidiary, Assam Oil, has the only production, which is at Digboi. Standard-Vacuum is doing preliminary exploration work and Assam has drilled several unsuccessful tests. Oil shows were reported in an Assam wildcat at Barsilla where drilling is proceeding below 5000 ft.

### IRAN

**Prod. 695,000 B/D Ref. Cap. 575,000 B/D**

In Iran production of crude oil increased in 1949 to an average of 562,000 bbl per day and is now far ahead of that. Most of this production came from the Agha Jari and Haft Kel fields, which contributed an average of 234,000 and 197,000 bbl per day respectively; production from the Masjid-i-Sulaiman, Gach Saran, Naft Safid, Lali, and Naft-i-Shah fields made up the balance. In the Lali field further sources of production have been proved to underlie the present producing field.

During the year 50 miles of pipe were added to the main pipe line system in Iran, making it 1718 miles in all. During the year an average of 52,000 bbl per day of crude oil was exported from Mashur, the terminus of the 20-22-in. line from the Agha Jari field, which was commissioned in April, 1949.

Abadan refinery processed an average of 487,000 bbl per day of crude oil in 1949 and steady progress is being made in still further expanding throughput capacity and increasing operational flexibility. Construction of a catalytic cracking plant and lubricating oil plant is well advanced, together with considerable extensions to steam, power, and water services.

### IRAQ

**Prod. 128,000 B/D Ref. Cap. 9500 B/D**

Recent negotiations have raised the royalty to the Iraq government which, added to higher production, will increase revenue considerably.

Iraq Petroleum Company (British, American, French, Dutch) produced 5,198,736 tons (some 39,500,000 bbl) in the year pre-

ceding June 31, 1950 from the Kirkuk field. Here 12 producing wells were drilled and two observation wells. Four exploration wells were drilled in the Ain Zalah field, which is not yet on a production basis; one other wildcat was completed.

Plans for a new small government refinery were announced.

The 12-in. pipe line from Kirkuk to Tripoli was operating throughout the year. The 16-in. line from Kirkuk to Tripoli was commissioned in July 1949 but station construction was in progress throughout the year. The 12-in. line from Kirkuk to Haifa has remained closed throughout the year. Contract to build the 30-32 in. line to Banyas, Syria, was awarded Arabian Bechtel Company. The 566-mile line will allow Kirkuk field to reach still higher production.

### ISRAEL

**Ref. Cap. 83,000 B/D**

The problem of crude oil supplies for the Consolidated Refinery plant at Haifa has not yet been solved. The Arab League has blockaded Middle East oil. Some Venezuelan oil is coming in by tanker but not enough to run at capacity, perhaps as much as 20,000 bbl daily.

### ITALY

**Prod. 250 B/D Ref. Cap. 112,000 B/D**

Instead of leaving oil development to private companies as was expected, the Italian government has extended state control over the Po Valley region where the largest oil discovery in the nation was found. Several companies, including the government company, are exploring and drilling in various central and southern areas.

Several new refineries are under construction or scheduled. Building are: Condor refinery of 20,000 bbl capacity near Mila; Soc. Anon. Raffineria Padana Olii Minerali refinery of 13,000 bbl at Trecate; Italia plant of 4000 bbl at Cremona; and a small 500-bbl a day plant at Milan of ROMA. Shell has been authorized to build a 40,000 bbl plant north of La Spezia.

### JAPAN

**Prod. 5000 B/D Ref. Cap. 45,000 B/D**

Development of the new deep zone in Yabase, Honshu, accounts for most of the increase in production. This new development is highly important in oil-poor Japan.

Refining capacity is difficult to judge as most refineries are still in a state of disrepair. Some modernization has been accomplished at Nippon Oil's refineries at Yokohoma City and Kudamatsu. The plant of Mitsubishi Oil near Tokyo is undergoing expansion and modernization. Refinery runs in 1949 averaged only 3500 bbl daily. according to Bureau of Mines figures.

### JAVA, H.E.I.

**Prod. 1500 B/D Ref. Cap. 2000 B/D**

Kroeka field (Shell) is the only one producing and its output runs only some 1500 bbl a day. Rehabilitation of other fields awaits more peaceful times. The Shell refinery at Wonokromo, damaged in political disturbances, processes 2000 bbl a day now and may be enlarged.

### KOREA

The Wansum refinery of 5000 bbl capacity and another small refinery are reported to be destroyed by UN bombing.

### KUWAIT

**Prod. 360,000 B/D Ref. Cap. 25,000 B/D**

This small sheikdom is the marvel of production. The only field, Burghan, doubled its production to 246,000 bbl a day in 1949 and is now producing more than 360,000 bbl a day. A new 25,000-bbl capacity refinery was put into operation late in 1949 and an oil-loading jetty was built to accommodate 6 tankers. Kuwait Oil Company, Ltd. (Gulf and Anglo-Iranian) owns the concession.

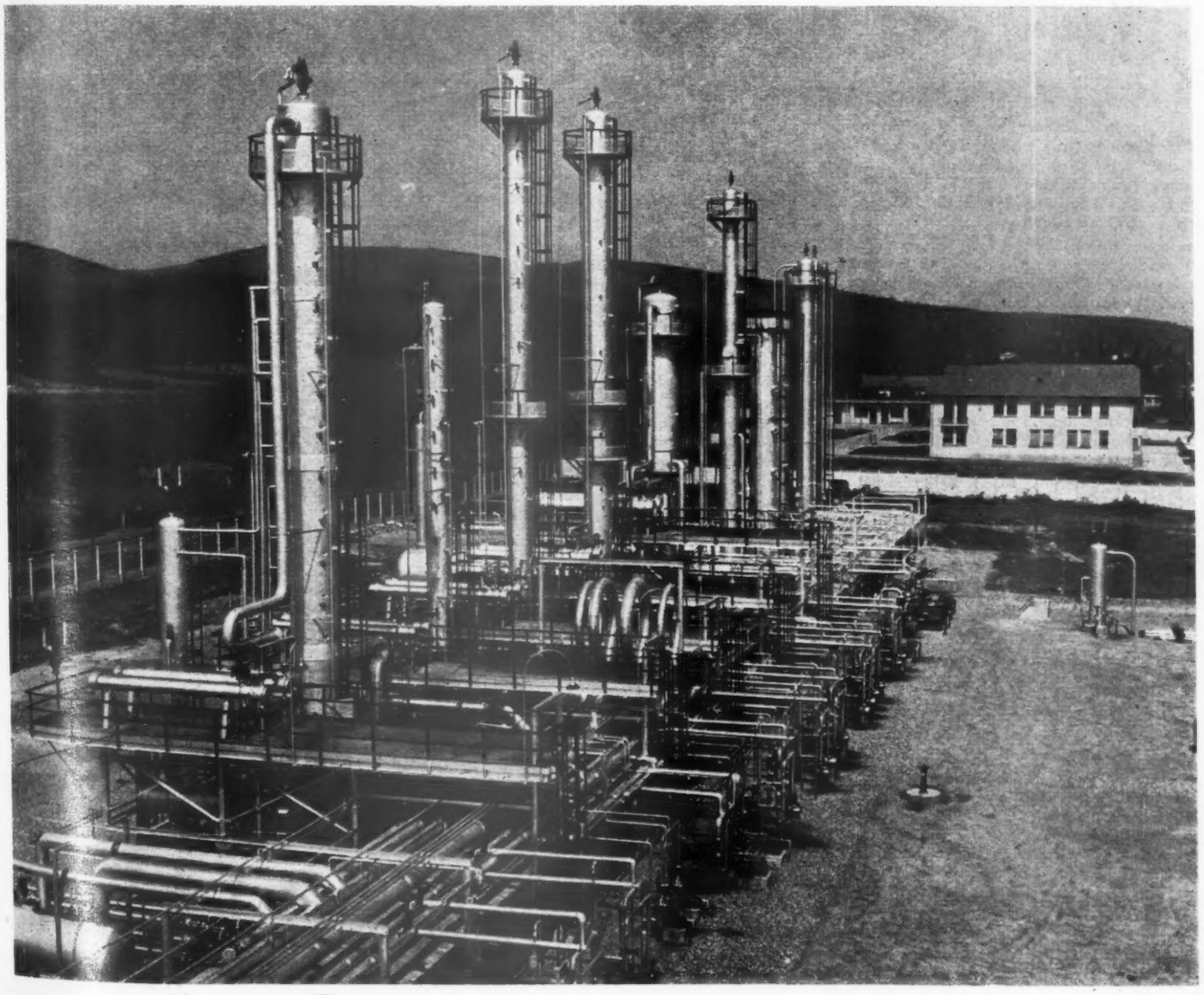
### LEBANON

**Ref. Cap. 11,000 B/D**

Iraq Petroleum Company's plant at Tripoli was enlarged to a crude capacity of 11,000 bbl a day. This is supplied by Kirkuk field over the IPC pipe line.

Refinery at Boussens

*Regie Autonome des Petroles photo by Yan*



Air view of Abadan refinery, which has a half million barrel a day crude oil capacity. *Anglo-Iranian Oil Company photo*

### MEXICO

**Prod. 195,000 B/D Ref. Cap. 200,000 B/D**

A major discovery by Mexican American Independent Oil Company in Southern Vera Cruz was the outstanding exploratory achievement of the year. The No. 1 Tortuguera had a production of 1170 bbl on tests from sand at 4680 ft.

More development wells (77 in first half of 1950) were being drilled and production mounted to 195,000 bbl a day and apparently will continue to increase. The spectacular rise of Mexican consumption, which has been 2½ times the U. S. rate in the last 12 years, spurs the effort to production gains.

Exploration also was increasing. Several U. S. companies were wildcatting under contracts with the Mexican government whereby they received expenses from the oil they recovered and a percentage after expenses were paid.

Petroleos Mexicanos, government company, reported refining runs:

Tampico area, 4 refineries, 90,000 bbl a day; Poza Rica, topping unit, 6,000; Minatitlan refinery, 24,000, and Mexico City refinery, 50,000, making a total of 170,000 bbl a day.

A new 20-in. gas line from Poza Rica to Mexico City has begun its operation. During 1949 the construction of the Salamanca refinery, the 12-in. 280-mile pipe line from Poza Rica to Salamanca and substantial additions to the Poza Rica field were continued. The 155-mile 10-in. pipe line across the Isthmus of Tehuantesec is being built.

At present the Salamanca refinery has begun operations. It has 30,000 bbl per day capacity, is a completely integrated refinery, including 4000 bbl per day thermal cracking.

The additions to the Poza Rica field consist of a hydrogen sulfide removal unit, increasing capacity of an absorption plant and a crude stabilizer unit. Facilities for pressure maintenance of the field, a sulfur manufacturing unit for the conversion of $H_2S$ to sulfur with a rated capacity of 140 tons a day and all the accessories and auxiliaries. These additions are scheduled to begin operating by next September.

### MOROCCO

**Prod. 750 B/D**

Societe Cherifienne des Petroles (French and Morocco governments), which went in for employee classes after the war to teach modern methods, is reaping benefits in increased production. The 750 bbl a day is small but up from 250 bbl last year. Drilling was about the same, 57 wells; one well was drilled to 12,500 ft. Three rigs are operating in the field and 4 tests are going down. ECA has approved use of funds for exploration and drilling program. The refinery at Petitjean was expanded to 1500 bbl capacity.

### NETHERLANDS

**Prod. 13,000 B/D Ref. Cap. 75,000 B/D**

The Schoonebeek (Shell Jersey-Standard) production has risen to 13.000 bbl a day and refined products to 90,000 bbl a day. The Shell plant at Pernis (Rotterdam) has a throughput of 55,000 bbl of crude oil and expansion plans will increase size to 75.000 bbl a day capacity. Caltex has a 20,000-bbl plant at Pernis that began operation this spring.

### NETHERLANDS WEST INDIES

**Ref. Cap. 750,000 B/D**

*Curacao.* Throughput at Shell's refinery continues to increase. The plant has 200,000 bbl distilling capacity and 100,000 bbl cracking capacity. Crude intake is 290,000 bbl a day.

*Aruba.* Lago Oil and Transport (Shell) is running 435,000 bbl crude oil through its plant here and Shell has a 35,000 bbl run.

### NEW GUINEA, N.E.I.

**Prod. 5000 B/D**

One field, Klamono, is producing. Some exploratory drilling is under way in new structures but no oil discoveries made. Shell, Standard Vacuum, and Caltex own the company that conducts operations in this area.

### NICARAGUA

During the latter part of 1949, all operations in Nicaragua by subsidiaries of Gulf Oil and Atlantic Refining were terminated and decision reached to withdraw from that country. Results of evaluation work conducted up to that time indicated that further expenditures were not justified.

### NORWAY

Modernization of the 1000-bbl skimming plant at Vallo is underway.

### PAKISTAN

**Prod. 3000 B/D Ref. Cap. 5800 B/D**

The deep test—12,666 ft—of Burmah Oil in the Sind desert had gas shows but ran into water. The company, however, made a discovery in West Punjab area at 8214 ft. Attock Oil has the only refinery, at Punjab.

Pakistan has recently granted more liberal terms for exploration and production concessions.

### PAPUA

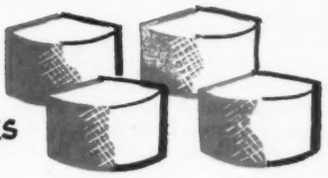
Island Exploration (Vacuum and Anglo-Iranian) and Shell Development continue to prospect in Papua. Gravity and seismic surveys are being made and three rigs are drilling. In 13 years of exploration no commercial oil has been found.

### PARAGUAY

Union Oil Company of California after spending 5 years and some $7,500,000 on its concession here has forfeited its agreement. Five test wells were drilled on the 55,000,

# Easy Lesson in CONSERVATION ECONOMICS

If you have several cone roof tanks



that can be interconnected,

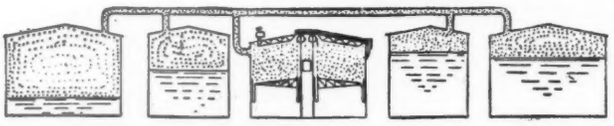
you can convert breathing losses

and filling losses

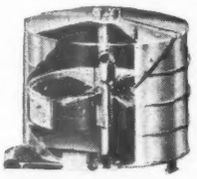
into profits quickly. Field studies at a typical gasoline plant

show $aving$ of more than 5,000 gallons

a week when six cone roof tanks were hooked up

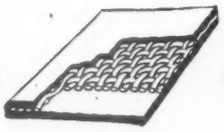


with a Wiggins DRY SEAL Gasholder.



Including expenses,

amortization took less than 20 months. What's more, the Wiggins 100% DRY SEAL



cuts out rain

and snow

maintenance problems.

Send for Full Data on the Wiggins Dry Seal Gasholder. Also—without obligation—ask for a "Pay Out Analysis" of your storage set-up.

WIGGINS VAPOR SEALS GENERAL AMERICAN TRADE MARK

**GENERAL AMERICAN**
**TRANSPORTATION CORPORATION**
**135 South LaSalle Street, Chicago 90, Illinois**

*District Offices:* Buffalo • Cleveland • Dallas • Houston
Los Angeles • New Orleans • New York • Pittsburgh
St. Louis • San Francisco • Seattle • Tulsa • Washington

*Export Dept.,* 10 East 49th Street, New York 17, New York

000 acre concession. The company's fifth dry hole, Orihuela No. 1, was abandoned in October 1949 at a depth of 6715 ft.

### PERU

**Prod. 40,000 B/D Ref. Cap. 34,500 B/D**

Restrictions on oil concessions have been lifted enough to attract some exploratory interest. Conorado Petroleum, Richmond Petroleum, and International Petroleum have obtained permits and Conorado is already conducting surface geology and gravity-meter studies.

Production of 40,000 bbl a day is kept up by heavy development drilling. Only one wildcat was drilled in 1949.

A reorganization of Empresa Petrolera Fiscal, the government company, followed dissatisfaction with the agency by the ruling military junta.

### PHILIPPINES

Philippine Oil Development Company continues to explore its concession and reported gas from Cebu No. 3. This small independent company has been exploring the Islands since before the war with indifferent success. The Philippine government established new laws regulating exploration, which oil men believe need some revision to attract capital.

### POLAND

**Prod. 2500 B/D(?) Ref. Cap. 18,000 B/D**

It must be remembered that about three-fourths of the old Polish fields have been annexed to Russia proper. Estimates are based on very little actual data.*

### PORTUGAL

**Ref. Cap. 10,000 B/D**

Plans are made by the government oil company to build a 10,000-bbl a day topping unit, 5000 cracking and 2500 reforming at the Cabo Riuvo plant.

### QATAR

**Prod. 30,000 B/D**

At the end of 1949 production began in Qatar after 15 years of effort toward that purpose by Iraq Petroleum. Before a single tanker left the peninsula the reserves had already been estimated at one billion barrels. From December 1949 to June 30, 1950, a total of 765,260 tons was produced from the field. Five wells were drilled in the last year and a 14-in. pipe line was completed from Dukhan field to Umm Said.

Petroleum Development (Qatar), an Iraq Petroleum subsidiary, holds the concession on the entire peninsula and 3 miles from the shore. Superior Oil and Central Mining and Investment, a London firm, has a lease from the line 3 miles out to 12 miles offshore.

*See *The Petroleum Engineer*, March, 1950, Page A-45.

*Courtesy M.T.A. Institute*

Raman Well No. 1. The first well to strike oil in Turkey. It came in in 1940.

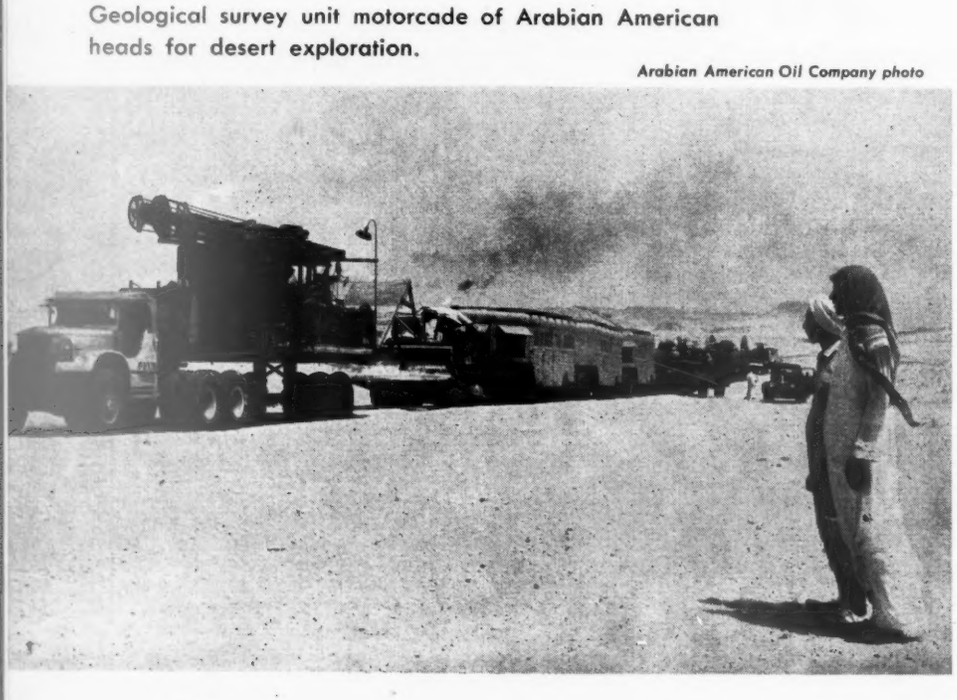
### ROMANIA

**Prod. 80,000 B/D Ref. Cap. 140,000 B/D**

Production in this old oil-producing country is decreasing in spite of drilling, according to report. The oil industry is nationalized and Communist run.

Geological survey unit motorcade of Arabian American heads for desert exploration.

*Arabian American Oil Company photo*



### SAKHALIN

Included in USSR.

### SARAWAK

(See Borneo, British.)

### SAUDI ARABIA

**Prod. 550,000 B/D Ref. Cap. 140,000 B/D**

Crude oil production in Saudi Arabia during July amounted to 17,315,765 bbl, or an average of 558,573 bbl per calendar day, according to the Arabian American Oil Company.

Crude processed at the company's refinery at Ras Tanura amounted to 3,101,153 bbl, or an average of 100,037 bbl per calendar day.

Crude oil production for the first seven months of 1950 amounted to 105,845,358 bbl, an average of 499,271 bbl per calendar day. Crude run in the refinery for the same period was 18,649,426 bbl, an average of 87,969 bbl per calendar day.

The 1068-mile trans-Arabian pipe line, due for completion in early 1951 will carry 300,000 bbl a day from the Persian Gulf fields to the Mediterranean.

### SICILY

Petroleum legislation has been approved that should promote exploration. Gulf is now making studies of the geology. Macmillan, which also holds a concession, began exploring the island in 1943. Sicily has autonomous powers over its minerals although politically a part of Italy.

### SPAIN

**Ref. Cap. 25,000 B/D**

CIEPSA, a company owned jointly by Vacuum Oil Company, S.A.E. and the Spanish firm CEPSA, completed its second deep well in February 1950. The well, Burgo de Osma No. 1, was drilled on an anticline to a total depth of 7253 ft. Loss of circulation in the cavernous and fractured limestone gave difficulty near the surface and between 4450 and 5600 ft. High formation dips were common. The well reached its objective and was abandoned as a dry hole. Following the completion of Burgo de Osma, Socony-Vacuum withdrew from exploration in Spain.

Another well will be shortly drilled at

LaMarina, near Alicante, in southeastern Spain. An extensive geological reconnaissance program in the search of oil is being carried on by the same company. Several other prospects made by the government-sponsored concerns, CAMPSA and INI, are being carried on, too.

The expansion of the Tenerife refinery, owned by Compania Espanola de Petroleos S.A. (CEPSA), has been completed and is running satisfactorily. The capacity of this refinery now is 19,000 bbl a day.

The Cartagena refinery has already under operation its distillation plant, with an effective capacity of some 6000 bbl. The erection of units to enlarge its capacity up to 20,000 bbl a day is progressing satisfactorily.

### SUMATRA, N.E.I.

**Prod. 110,000 B/D Ref. Cap. 135,000 B/D**

Only the southern fields have returned to full operation, the northern fields cut off by political unrest. Despite this, output has gone from 85,000 to 110,000 bbl daily. A score of development wells have been drilled but only one exploratory well.

The Shell refinery at Pladjoe processes 71,000 bbl crude oil and the expanded Standard Vacuum plant at Palembang uses 64,000 bbl a day.

### SWEDEN

**Ref. Cap. 24,800 B/D**

An LPG plant is under construction at Orebro.

### TRIESTE

**Ref. Cap. 16,000 B/D**

The two refineries in Trieste have undergone extensive modernization. Aquila's 13,500 bbl crude capacity plant has planned an expansion program for the next two years. The smaller plant of SIAP (Jersey Standard) has completed several new units.

### TRINIDAD

**Prod. 56,000 B/D Ref. Cap. 95,000 B/D**

Total production of crude in 1949 was 20,616,721 bbl, an average of 56,484 bbl per day. This represents a 2½ per cent increase compared with the previous year's figure. The average daily production per producing well, however, again declined, being 27 bbl per day, according to the Petroleum Association of Trinidad.

Twenty-four drilling rigs were in continuous operation, 20 being employed on exploitation and 4 on exploratory work. The total footage drilled was 630,209 ft as compared to 638,681 in 1948. Despite continued heavy expenditure by the oil industry on exploration work, no new oil reservoirs have yet been discovered. The exploration program continues; further deep drilling to test the Cretaceous is being planned by the oil companies.

A new royalty formula, to provide a sliding scale of royalty ranging from 10 per cent to 12½ per cent of the value of the crude, according to productivity of the individual wells, was brought into force during 1949. In 1950 Government commenced the issue of marine licenses.

Importation of foreign crude for refining or blending and re-export increased considerably, averaging nearly 1,000,000 bbl per month. Crude runs to still amounted to 29,617,000 bbl, an increase of 9.4 per cent over the 1948 figure. The Trinidad leaseholds refinery at Pointe-a-Pierre is to be modernized by the installation of a fluid catalyst cracking plant with capacity of 15,000 bbl per day and the attendant vacuum distillation column. The manufacture of petroleum chemicals has now begun in the Colony.

### TRUCIAL COAST

Iraq Petroleum is doing some exploratory drilling here. The concession is owned by affiliates of the company. First wildcat was spudded in February of this year.

### TUNISIA

Two new concessions were granted by the French government, one with Gulf and the other with Shell. Both companies are associated with French companies in the venture. Exploratory work has already begun.

### TURKEY

**Prod. 600 B/D Ref. Cap. 1400 B/D**

The development of the Raman field has gone ahead with the drilling and the completion of Nos. 18, 7, and 19, according to the M.T.A. Institute, Ankara. These wells have shown water, fixing the limits of the field to the north, west, and south. The well No. 10, which produced oil for a while, began to show water during the year further reducing the northern limit. On the other hand wells 8, 9, and 12, drilled previously near the apex of the structure, produce oil for the requirements of the topping plant at Batman and the oil-burning locomotives. No. 14, the deep test, was abandoned at 2362 meters on account of mechanical difficulties. The heavy rig on this location has been moved few hundred meters north to location No. 16. The other rigs were drilling Nos. 21 and 23 at 631 and 112 meters, respectively, at the end of June.

In the region of Adana geological and geophysical activity has gone ahead, the latter at reduced rate. The drilling in this area began at Agzikara and Hocali in December 1949 and January 1950, respectively. At present the Agzikara well is drilling around 1900 meters. At Hocila the heaving shale trouble, which had caused the abandonment of drilling in 1939, has been giving trouble again through larger pumps and heavier equipment all around are being used. The drilling at Hocali has been temporarily stopped after reaching a depth of 856 meters. Drilling at Adana as well as at the Raman field has continued to be under the supervision of Drilling and Exploration Company, Abilene, Texas.

### UNITED KINGDOM

**Prod. 900 B/D Ref. Cap. 210,000 B/D**

The large refining expansion going ahead in the British Isles is the biggest news here. Earlier this year American oil companies came to terms with the British government over operating in the United Kingdom for pounds instead of dollars.

In England Shell is expanding and modernizing its Shellhaven and Stanlow plants. Anglo-American is enlarging its Fauley plant from 20,000 bbl to 110,000 bbl a day capacity. Berry, Wiggins and Company plans a new two-stage distillation unit for its Hoo plant. Lobitos is adding several new units at Ellesmere Port. Socony-Vacuum plans to build a 20,000-bbl refinery in Coryton. At Llandarcy, South Wales the plant of National Oil Refineries will have a catalytic

Unloading 6-in. casing at Anaco warehouse yard of Socony-Vacuum in Venezuela. Casing will be stored here until needed by rigs throughout the country.

# ON THE WORLD'S LARGEST OF

## Cooper-Bessemer flexibility is Creole's gain ...on the big Ulé-Amuay line

Power for Creole Petroleum Corporation's big, 143-mile crude line is furnished by 14 Cooper-Bessemer engines. All are modern, Type LS 8-cylinder units. This standardization naturally permits simplified operation as well as substantial economies in parts inventory and maintenance. But to achieve such standardization required engines with flexibility to operate efficiently on different type fuels.

For example, of the seven LS engines in Creole's Ule' pumping station (shown opposite), two are operating as gas-diesels, burning only pilot charges of fuel oil. All seven will soon be operating as gas-diesels . . . all easily switched to 100% oil, or *any combination* of oil and gas, at will. At the Dabajuro station, midway on the line, there are 7 more LS-8's. Here these Cooper-Bessemers operate on crude from the line.

Full gas operation, 100% oil, gas-diesel, or speedy conversions from one to another . . . you'll find proved Cooper-Bessemers of the type and size you need, ready to give you the best there is in efficiency and over-all economy.

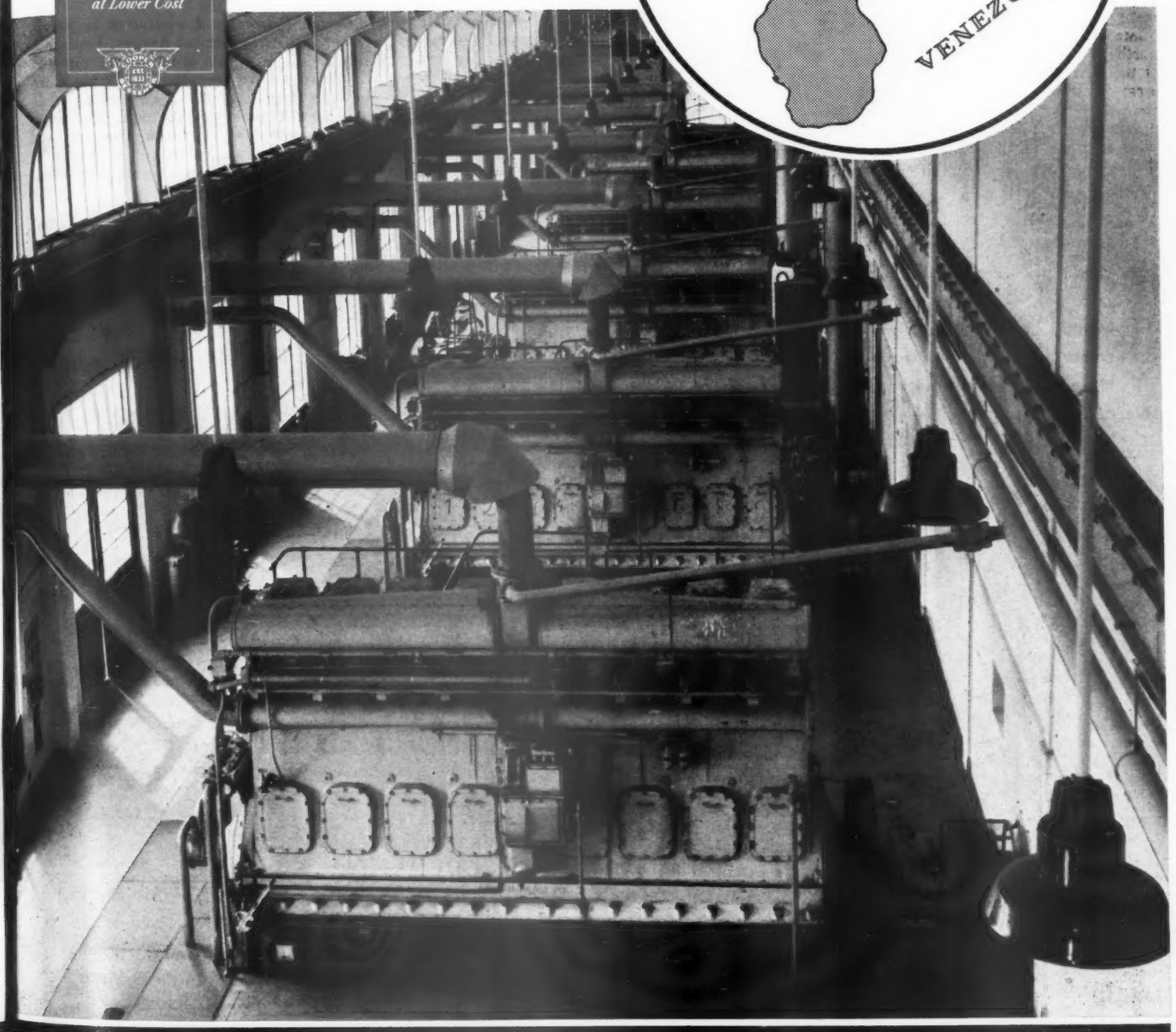
Right: six of seven Cooper-Bessemer LS-8 engines in Creole Petroleum Corporation's Ulé pumping station. Engines, direct-connected through a firewall to 8" x 24" triplex pumps, are rated 1000 bhp at 300 rpm. Rated capacity of each pumping unit is 50,000 bbl a day.

**GAS · DIESEL · GAS-DIESEL ENGINES**

New York Washington Bradford, Pa. Parkersburg, W. Va. San Francisco, Cal. Seattle, Wash. Houston

# ST OPERATING CRUDE LINE...

*Another Example of Efficient Power at Lower Cost*



by **Cooper-Bessemer**

MOUNT VERNON, OHIO AND GROVE CITY, PENNA.

Houston, Dallas, Greggton, Pampa and Odessa, Texas  Tulsa  Shreveport  St. Louis  Los Angeles

cracker and a lube unit; at Grangemouth, Scotland, Scottish Oils is installing a 30,000 bbl a day crude distillation unit and plans a catalytic cracking unit. Refining capacity has increased from 120,000 bbl last year to 206,000 this year. Anglo-Iranian has been given a permit to build a $42,000,000 refinery at the mouth of the Medway.

Petroleum from Nottinghamshire fields amounted to 45,000 tons in 1949 or about 900 bbl a day. Scottish shale oil output was larger, 112,000 tons for 1949.

### URUGUAY

**Ref. Cap. 17,000 B/D**

Within the petroleum exploration program that the ANCAP is developing with the advice of DeGolyer and MacNaughton of Dallas, Texas, and the cooperation of the Instituto Geológico del Uruguay—the surface geological studies in the northern part of the country being completed—the moment has come to investigate through adequate prospection the western part of the northern area. With this purpose, the Board of the ANCAP has recently approved, upon a careful selection, the engagement of a firm from the United States, specializing in geophysical surveys for the development of this kind of work in the northwestern area of the country, i.e., the Departments of Artigas, Salto, Paysandú, and the western part of Rivera and Tacuarembó.

In this area of a quite peculiar geological nature several wells have been already drilled, the most important of them in Tacuarembó (350 m), Artigas (over 500 m), Paso Ullestie (about 1000 m), and Arapey (about 1500 m). The cores and cuttings are taken from said wells at different depths. It is precisely on account of the peculiar geological nature of the area that it will be necessary to revert to the method deemed best suited, geophysics, to determine the location for new test wells.

### U.S.S.R.

**Prod. 660,000 B/D Ref. Cap. 630,000 B/D**

Soviet production is mere guesstimate. Rarely does news slip from the petroleum commission. The U. S. Bureau of Mines estimated 660,000 bbl a day for 1949 and there is little reason to believe any increase of moment has been made. A new field, Busovny, northwest of the city of Baku, was announced but its 20,000 bbl a day production would hardly offset the downward trend of the Baku area.

Refining capacity is probably enough to handle crude oil production.

Russia's low oil production is said to be her largest deficiency in war potential. Certainly Russia could not pursue all-out mechanical warfare on the oil production estimated by U. S. authorities. The fact that direct conflict came first in Korea instead of Iran argues that Russia is not ready for all-out war.

### VENEZUELA

**Prod. 1,600,000 B/D**

**Ref. Cap. 250,000 B/D**

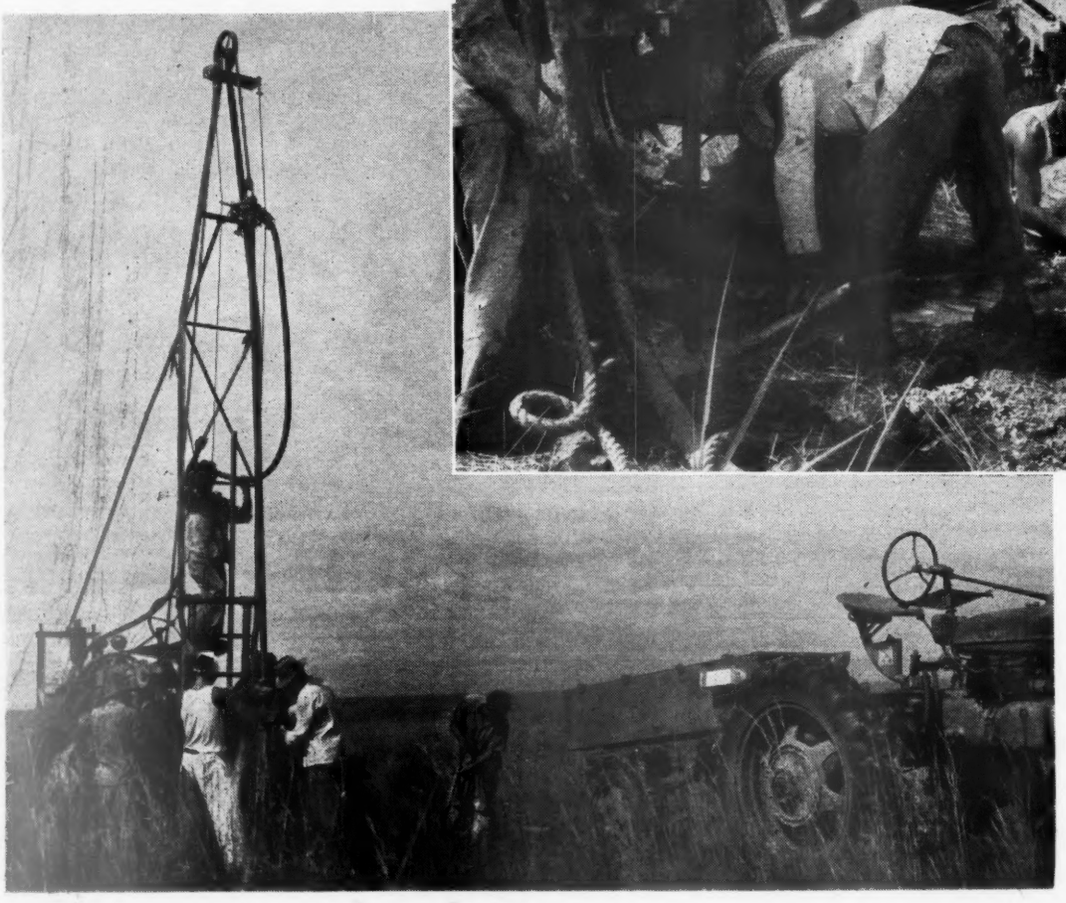
Outside the U. S., Venezuela is far ahead of any other country in production and the war sent volume climbing. In compliance with government laws all the large operators have refining interests and expansion rivals that of Western Europe.

About 70 rigs are working in the country. Activities of the larger operators include:

*Mene Grande* completed a 10,000 bbl a day producer in Mara field. Its Los Mangos No. 1 discovered a new field in Anzoategui.

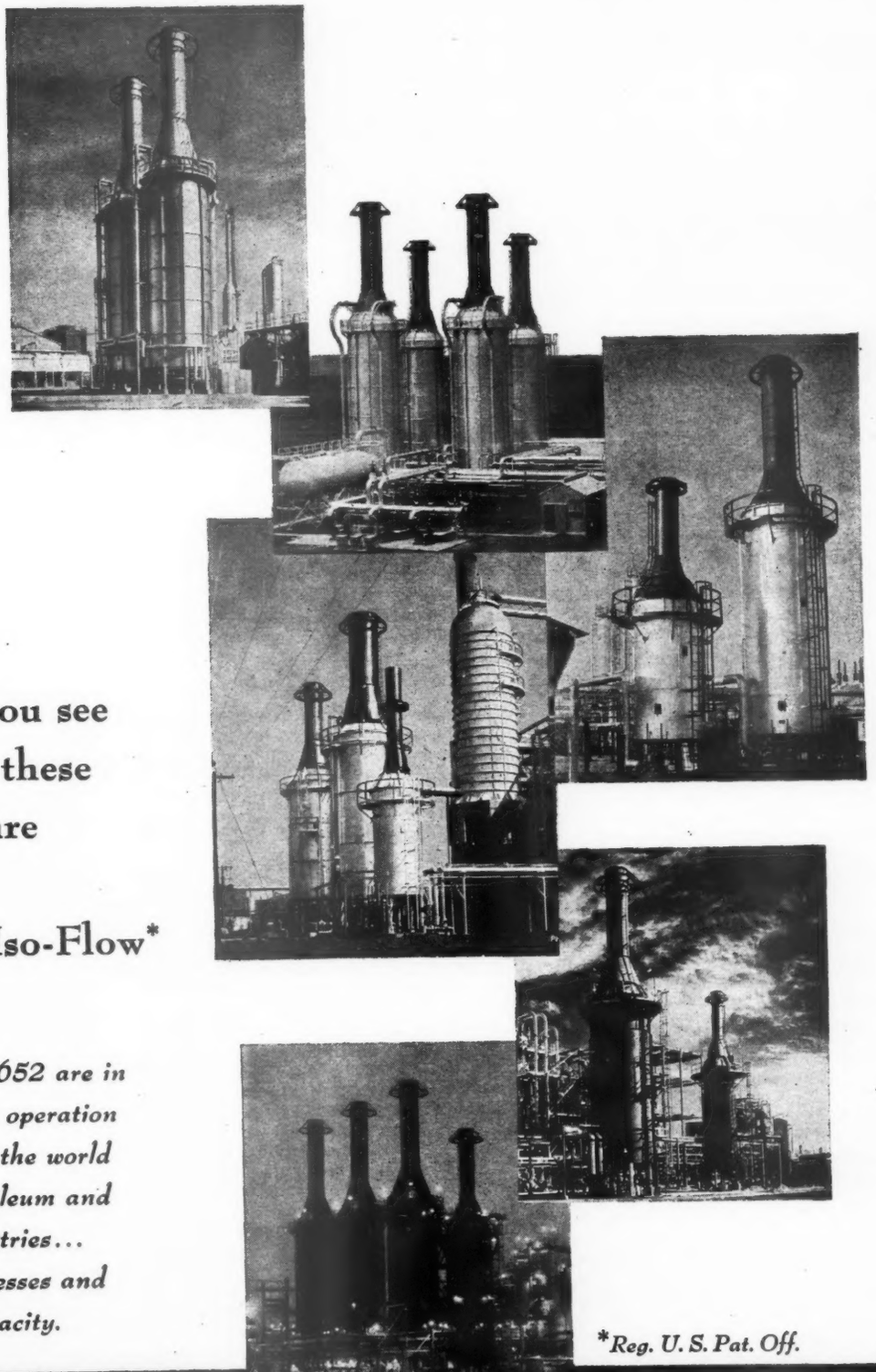
*Creole Petroleum Corporation* began operations at its refinery at Amuay, Venezuela, January 3 with at atmospheric pipestill. Crude runs have averaged 52,000 bbl a day for the first 6 months. Lagunillas crude has been run for asphalt and Tia Juana Medium for fuel products. The unit was shut down during the month of August to tie in the vacuum stage, thereby completing

Specially constructed drill on rear of tractor of Socony-Vacuum for use in swampy terrain in western llanos of Venezuela during the wet season. Here seismograph crew drills to determine sub-surface structure before inserting charge of dynamite.



Seismograph crew of Socony-Vacuum drilling and mixing "drilling" mud in the Barinas area of Venezuela.

Socony-Vacuum photos



Whenever you see furnaces like these you can be sure they're Petro-Chem Iso-Flow* design

*More than 652 are in satisfactory operation throughout the world in the petroleum and allied industries... for all processes and for any capacity.*

*Reg. U. S. Pat. Off.

PETRO CHEM ISO-FLOW FURNACES

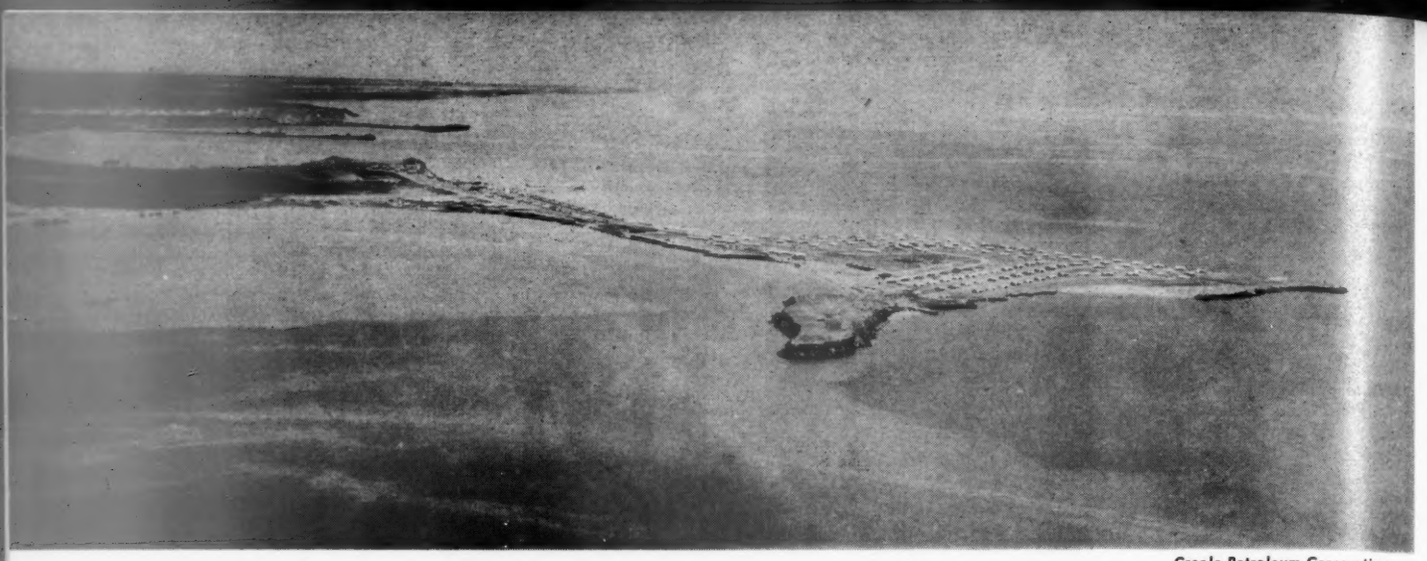
UNLIMITED IN SIZE . . . CAPACITY . . . DUTY

PETRO-CHEM DEVELOPMENT CO., INCORPORATED

120 EAST 41ST STREET, NEW YORK 17, N. Y.

Representatives: Bethlehem Supply, Tulsa and Houston · Flagg, Brackett & Durgin, Boston · O. O. Foster, Pittsburgh · Faville-Levally, Chicago · Lester Oberholtz, California

There's a Petro-Chem Iso-Flow Furnace and Boiler for every service, capacity or duty, irrespective of temperature pressure ranges . . . none too small or too large . . . more than 652 in operation throughout the world in the petroleum and allied industries performing with utmost satisfaction . . . and in many instances operating in excess of their design capacity by more than 50%.



Creole Petroleum Corporation

**Aerial view of Creole installations at Amuay Bay gives an idea of its vast size.**

the processing units of the refinery. Crude runs are currently at 60,000 bbl a day on T. J. Medium and T. J. 102 crudes. Construction has been completed on 250 workers' houses and 20 new staff houses, which completes the colony program for the present.

Operations at Creole's Caripito refinery continue with the vis-breaking unit averaging 35,000 bbl a day of Quiriquire crude and the topping unit 24,000 bbl a day of Jusepin crude for the first six months of the year. Additional facilities at the Jusepin pressure maintenance plant in eastern Venezuela are planned to bring the capacity from 10 to 25,000,000 cu ft of gas daily. C. F. Braun and Company has the contract. Creole has the largest production of any company operating in Venezuela, nearly 700,000 bbl a day.

*Shell* interests, second largest producing company in the country, drilled more than a hundred wells in western Venezuelan fields. One of its wells, north of a La Paz field, came in for 6500 bbl a day.

Shell has filed with the Venezuelan government an application for permission to build a crude oil pipe line from Lake Maracaibo to Punta Cardon. Cost is estimated at $2,300,000.

The 100-mile line from Las Mercedes and Tucupido to Caracas is under construction.

*Venezuelan Atlantic Refining's* drilling operations during the past year were concentrated in the Tucupido and Ruiz areas, in the State of Buarico (eastern Venezuela) on jointly-owned concessions as well as on a wholly-owned property in the Taman area, which adjoins the Tucupido field. On the joint interest properties at Tucupido and Ruiz, a total of 50 wells were completed during the year beginning September 1, 1949, of which 43 were producers. Three wells are now drilling in the Ruiz area and one exploratory rig is operating in the Tucupido area. At Taman, 23 wells were completed of which 18 were producers. During the period under review production reached a peak of 26,000 bbl per day of gross production from wholly-owned and joint-interest concessions, of which 15,000 bbl represented the net production of Venezuelan Atlantic. Present gross production is about 21,000 bbl per day.

Some seismograph work was done and a limited program of exploratory wells and structure drill work was conducted in certain other regions in eastern Venezuela but no significant developments resulted from these activities.

In Western Venezuela, the company, through subsidiaries, owns a substantial interest in Guasare Oil Company. In August 1949, Guasare Oil Company initiated the drilling of a deep wildcat well, called Guasare No. 1, in search of oil in the Cretaceous strata, from which prolific production has been obtained by other companies in the Mara fields some 18 miles to the east. This well has been carried to a total depth of 14,460 ft. Testing operations are now in progress.

A repressuring plant was constructed at Tucupido for injecting gas into some of the sand reservoirs of the Tucupido field to improve crude recoveries. Pipe line outlet for the Ruiz area was proved by completion of a 12-mile, 8-in. pipe line. This was an extension of facilities in the Tucupido and Saban areas.

*Phillips Oil Company*, a wholly-owned subsidiary of Phillips Petroleum Company, has a current daily production from Venezuelan properties of approximately 9000 bbl. In January 1949 a test well was completed in the 130,000 area block San Roque Pool in eastern Venezuela. Nineteen producing wells have now been completed, developing approximately 1050 acres. Further drilling and exploration are in progress.

In compliance with its Venezuelan oil concession contracts, Phillips has agreed to construct and operate a refinery and wax plant in eastern Venezuela. Construction of this plant, which will have a capacity of over 2,000,000 lb of high grade wax per year in addition to gasoline, kerosine, and other petroleum products, is expected to begin in 1951 and to be completed during 1952.

*The Texas Company* completed Raban wells 8, 9, and 10 in western Venezuela for a combined initial production around 10,000 bbl per day. Raban 11 is currently testing with 9626 ft and Raban 12 is drilling below 7000 ft. In eastern Venezuela, the Tucupita field is fully defined. In the Rincon Largo field the 4 producing wells are currently being worked over to reduce gas-oil ratios. Production was running around 1800 bbl per day prior to workover operations. Texas Petroleum is drilling a wildcat, Mata No. 1, in central Anzoategui. In Falcon it acquired a large block of acreage and has plans for a series of stratigraphic tests and wildcats.

The company has a third interest in the Venezuela Gulf Oil Refinery near Barcelona, which began operation this year.

The *Mercedes Company*, owned jointly by The Texas Company and Caracas Petroleum Company, is operating 4 drilling rigs and 2 workover strings from the Roblecito Camp in central Guarico. There are currently 103 producing wells in the Mercedes field compared with 82 last year; 40 producing wells at Palacio compared with 33; and 8 in Guavinita compared with 6 in 1949 for a total of 151 compared with 121 in the previous period.

*Sinclair Oil* is drilling one wildcat in Anzoategui. Seismograph surveys continued during the past year on the company's undeveloped concessions. The company operates a combination pressure maintenance and gasoline plant on its Santa Barbara property processing 31,000,000 cu ft of gas daily and returning approximately 17,000,000 cu ft to the producing formations. The plant is presently being enlarged.

Under construction is a modern refinery of 35,000 bbl daily crude oil charging capacity at the Puerto de la Cruz terminal, which will be completed during the latter part of 1950.

*Richmond Exploration Company* (Standard of California) has curtailed its Venezuelan operations during the past year. No wells have been drilled during 1950 in its Boscan field, which has 44 completed producers. Production from this low gravity field has varied from 5000 to 18,000 bbl per day during recent months. Two wildcat wells were drilled during the first half of this year. Both produced oil but were finally abandoned as non-commercial.

*Socony Vacuum* with exploratory drilling extended the productive area of the Chimire pool (eastern Venezuela) and new discoveries were made in Moriche 1 and Pradera 1. The Cachama 1 and Farallon 1, wildcat wells in the Greater Oficina area, were abandoned as dry holes. In western Venezuela, Silvestre wells 5 and 6 were completed as producers and Silvan 2 was drilling. Exploration surveys amounted to 63 party months, of which 32 were geological surface studies and 31 were seismograph operations.

### YEMEN

The Yemenese King has invited offers for an oil concession but reports are that those who have already discussed conditions find them unprofitable.

### YUGOSLAVIA

**Prod. 2000 B/D  Ref. Cap. 8000 B/D**

During the year 26 rigs have been drilling, mostly on development wells and a few unsuccessful wildcats. The daily production is much higher than estimates of last year's output.* It is also far from the 9250 bbl called for by 1951 in the Five-Year Plan. Also reported is a $60,000,000 fund set aside for equipment needed for oil development. * * *

*The Petroleum Engineer, May 1950, A-42.

*The Chicken or the Egg?*

# Is American Petroleum the Cause or Result of the Greatest Prosperity Known in History*

GAIL F. MOULTON†

For several decades the production and consumption of petroleum and its products in the United States, a country having about one-fourteenth population of the world, has been about twice that of the remainder of the world. Accordingly, it is appropriate to ask whether this enormous use of energy in various forms, and mainly to meet the individual desires of the average citizen, is the cause or the result of the greatest prosperity known in the history of the world. Nobody will deny that the petroleum and automobile industries, developed only in this country on so large a scale as to be used by nearly every man, woman, and child, are at least the symbol of the greatness of our economic system, if not, indeed, its sire. All of us, partisans of the petroleum industry, and proud both of its achievements as well as our own contributions to its progress, will doubtless agree that an abundance of oil at low cost to the user for the past three to four decades has been the fundamental factor in the economic progress of our country. A similar group from another industry probably would have an equal feeling that theirs was the fundamental achievement that gave opportunity to the rest of us. Unfortunately, only in the natural sciences are rigorous and mathematical proofs possible, and like the classic argument as to whether the chicken came before or after the egg, the role of petroleum in the development of our economy cannot be demonstrated beyond doubt.

We can concede doubts as to whether our great industry is the source or the product of our national prosperity, but we can have no doubt as to the importance of oil in maintaining our present status. Perhaps it is more worth our while here today to consider the past and future of our industry in the hope that we can determine the factors most important in its development and see whether they are involved in the social revolution now in progress both here and abroad.

It is interesting that economic literature contains many statements explaining mineral production in this country as the result of "unusual endowment by nature," thus establishing the United States as a most favored nation. Obviously, only the mineral deposits then exploited to a state of usefulness were in the minds of the authors of such statements. We know that in the case of oil and gas we have found many additional valuable deposits not suspected when it was determined that our endowment was rich, and we anticipate continuing discoveries. What then of the poorer "have-not" countries? Are they poor because there are no valuable deposits to discover, or are there vast mineral resources awaiting exploration, discovery and exploitation by modern technology? These are geologic problems which my professional associates can approach with confidence.

### Proved and Ultimate Reserves

Geologists and petroleum engineers have made estimates of the proved oil and gas reserves recoverable by production methods now in use for the producing fields of the world. Outside of Russia, data available permit reasonably close estimates. In addition to estimates of proved reserves, certain of my colleagues have attempted to estimate the probable ultimate production of oil by application of factors based on the volume and character of sedimentary rocks in general suitable for the accumulation of oil, and experience in portions of the United States where exploration of favorable areas is relatively complete. These estimates of probable ultimate oil production are a measure of informed geologic appraisal of the various countries and regions of the world, and in this discussion are called oil resources. The table, Summary of Oil Production, Proved Reserves and Resources, is a compilation of the best available data and relates cumulative production to proved reserves and oil resources. Noteworthy items shown in the table relate the past production, proved reserves and resources of the United States to the rest of the world. Our country, with about one-fourth of the oil resources of the world, at the end of 1949 had accounted for about 63 per cent of total world oil production and had in its producing fields about one-third of the proved oil reserves of the world. Here about 57 per cent of the oil resources have been dis-

**SUMMARY OF OIL PRODUCTION, PROVED RESERVES AND RESOURCES**

(Data after L. G. Weeks, published 1948, modified by G. F. Moulton)

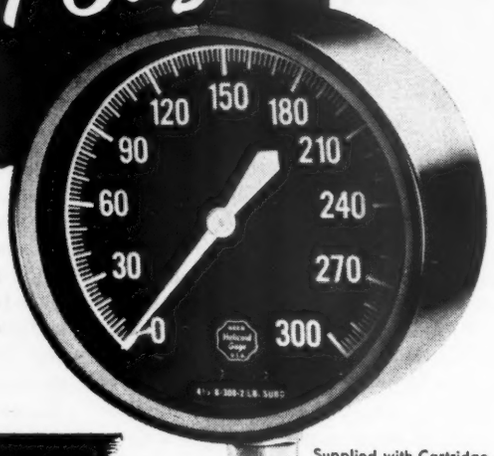
| Country or Region | Cum. production to January 1, 1950 | | Proved reserves January 1, 1950 | | Resources or estimated Ultimate production | | Per cent of resources | |
|---|---|---|---|---|---|---|---|---|
| | Bill. bbl | Per cent | Bill. bbl | Per cent | Bill. bbl | Per cent | Produced | Discovered |
| United States | 38.9 | 63.0 | 24.7 | 31.6 | 110.0 | 18.0 | 35.0 | 57.0 |
| Bal. North America | 2.6 | 4.2 | 3.0 | 3.8 | 40.0 | 6.6 | 6.5 | 14.0 |
| Total North America | 41.5 | 67.2 | 27.7 | 35.4 | 150.0 | 24.6 | 28.0 | 46.0 |
| Venezuela | 5.0 | 8.0 | 9.5 | 12.1 | 80.0 | 13.1 | .... | .... |
| Bal. South America | 1.7 | 2.6 | 1.0 | 1.3 | | | | |
| Total South America | 6.7 | 10.6 | 10.5 | 13.4 | 80.0 | 13.1 | 8.0 | 21.0 |
| Total Western Hemisphere | 48.2 | 77.8 | 38.2 | 48.8 | 230.0 | 37.7 | 21.0 | 37.0 |
| Europe, excl. Russia | 1.7 | 2.6 | 0.8 | 1.0 | 13.0 | 2.1 | 13.0 | 19.0 |
| Middle East, incl. Egypt | 3.5 | 5.5 | 33.0 | 42.0 | 155.0 | 25.4 | 2.0 | 24.0 |
| Bal. Asia, excl. Russia | 1.9 | 3.1 | 0.4 | 0.5 | 24.0 | 4.0 | 8.0 | 10.0 |
| Indonesia | 0.6 | 1.0 | 1.1 | 1.3 | 30.0 | 4.9 | 2.0 | 5.0 |
| Africa, excl. Egypt | .... | .... | .... | .... | 8.0 | 1.3 | .... | .... |
| Total Eastern Hemisphere, excl. Russia | 7.7 | 12.2 | 35.3 | 44.8 | 230.0 | 37.7 | 3.0 | 18.0 |
| Russia | 6.3 | 10.0 | 5.0 | 6.4 | 150.0 | 24.6 | 4.0 | 7.0 |
| Total Eastern Hemisphere | 14.0 | 22.2 | 40.3 | 51.2 | 380.0 | 62.3 | 4.0 | 14.0 |
| Total World | 62.2 | 100.0 | 78.4 | 100.0 | 610.0 | 100.0 | 10.0 | 23.0 |
| Total Foreign | 23.3 | 37.0 | 53.7 | 68.4 | 500.0 | 82.0 | 4.6 | 14.4 |

Gail F. Moulton
The Chase National Bank of New York
June 28, 1950

*An address given before the Rocky Mountain Oil and Gas Association, Cody, Wyoming, June 30, 1950.

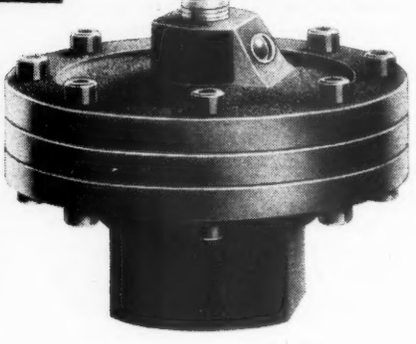
†Second Vice President, The Chase National Bank, New York.

# HELICOID Chemical Gage




*Standard dials:* 0-15, 30, 60, 100, 150, 200, 300, 400, 500, 600, 800, 1000, 1500, 2000, 3000. Also 0-30" vac., 15 and vac., 30 and vac., 60 and vac.

Supplied with Cartridge Snubber in socket for pump service.

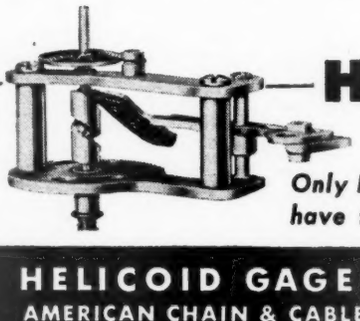


Bronze
Cast Iron
Lead Coated Iron
Steel
Stainless Steel (316)
Monel
Hastelloy B
Hastelloy C
Dural (24 S-T)
Carpenter No. 20 (Duramet)
Nickel
Everdur
Hard Rubber

● Here's a chemical gage for any pressure to 3,000 p.s.i. and also for vacuum or compound ranges, and temperatures to 300° F. Particularly suitable for chemicals and other viscous liquids that either corrode or clog a Bourbon tube gage.

One feature of this Chemical Gage is that the diaphragm is made of "TEFLON" which is flexible and resists practically all corrosive chemicals. No fragile metal foils are used. The diaphragm chamber is supplied of any metal most suitable for the service.

Available in the following dial sizes: 4½", 6", or 8½". 1" female N.P.T. bottom connection. Flanged connection also supplied.



**HELICOID**

*Only Helicoid Pressure Gages have the Helicoid Movement*

ACCO

TRADE MARK

**HELICOID GAGE DIVISION**
AMERICAN CHAIN & CABLE COMPANY, INC.
Bridgeport 2, Connecticut


covered, as contrasted with the discovery of about ten per cent of the oil resources of foreign countries. Further, we note that the Middle East has proved reserves substantially greater than ours. These reserves were discovered as the result of the drilling of a few hundred wildcat wells. In our country, during 1949, nearly 4,500 new field wildcat wells were drilled, resulting in 506 discoveries. A total of over 9,000 exploratory wells drilled in the United States during 1949 provided new reserves of about 2.5 billion barrels according to American Petroleum Institute estimates. In some other countries similar additions to reserves have been made during the past few years by the drilling of less than 100 wells. The data explode the myth of superior endowment by nature more violently than a hydrogen bomb!

### Russia vs U.S.

Perhaps a moment of consideration of the situation of Russia will serve to illustrate my point even more clearly. Whereas the resources of this vast country are estimated as being materially greater than those of the United States, current rates of production and proved reserves of oil are believed to be comparable with those of the State of California. There is a lesson for all of us in this contrast, for it is my opinion that the basic difference between that country and ours explains our preeminence in oil production as well as in our level of prosperity—it is not merely a difference in our languages.

Whether the petroleum industry is the golden egg laid by the chicken of our prosperity, or the chicken itself, there can be little doubt that the economic success of the country is the result of a favorable political and social climate combined with the determination and resourcefulness of its citizens. With respect to the petroleum industry, there can be little doubt that its early and continuing growth in this country is founded on the private ownership of land, including minerals beneath the surface, the right of these owners to make contracts for mineral exploration and development with whomever they chose, and the right of other individuals, either alone or in groups, to speculate in petroleum exploration with resources which they had accumulated. Although probably wasteful, the early unrestricted production of oil permitted the rapid return of speculative capital and provided important accumulation of capital with which to undertake similar exploration elsewhere. These rights of free choice of free men to make such arrangements as they might de-

sire with respect to their own property are undoubtedly the fundamental difference between those "have-not" countries with their great petroleum resources and our country with its great petroleum production and prosperity. The failure of governments in business is universal, and is particularly noteworthy in the oil producing business.

Consider for a moment what the petroleum industry means to the United States. The total investment is approximately 30 billion dollars, providing employment for about two million workers, of an average capital invested of $15,000 per worker. The products of the industry are used daily by nearly every one of us and at low cost in terms of daily wages. Clearly our industry, if not the cornerstone of our prosperity, is fundamental to it.

Two clouds are visible on our business horizon. First, oil producers in our country are believed to be exploring for the last two-fifths of our oil resources, which on the average will be found in smaller pools, at greater depths, and probably in areas of greater operating difficulty than the reserves now known. To discover and produce these resources, without which we would become largely dependent on foreign oil within a decade, our oil producers need all the financial incentives which they now have, and possibly more. Lacking progressive conversion of these resources, our national security, itself, may be imperiled. Taxes in our present government's deficit economy are an important and sometimes determining factor in all private business. Recently we have seen our revenue-hungry Treasury Department attempting to increase the already large tax burden of the petroleum producer by reducing the statutory depletion allowance which has been in effect for more than twenty years. It is clear that in the remaining oil exploration in our country the oil producer should have at least his present tax advantages to provide the incentives for continuing his efforts through the leaner years ahead. It is more than probable that in another decade he will be justified in urging a material increase in depletion allowances because he will then be producing from reserves obtained at higher cost, and cannot hope to recover his capital investment on the present depletion basis. Thus, we are justified in taking a stand against reduction in depletion allowance and in informing our Congress of the probability that it should be increased in the future.

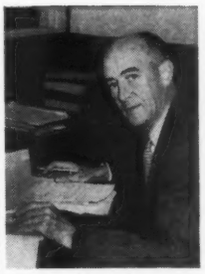
In addition to being discouraged if profits from risk of his capital are materially reduced by onerous taxes, the oil producer also finds that loss of depletion allowance would have an adverse effect when after discovery he seeks to borrow capital with which to exploit his new property. Banks and other potential leaders must consider the probable impact of taxes on the income which might be used for debt service. Accordingly, increased taxes reduce the producer's borrowing power and increase the ratio of equity to borrowed capital which must be provided by him.

### Future Depends on Freedom

Second, a large part of the oil to be discovered is not under privately owned lands. As stated earlier numerous wells are drilled annually to maintain the production and reserves in this country. Most drilling has been done, and is being done, on privately owned lands under conditions similar in many respects to those prevailing during the early growth of the industry. The problem of leasing and exploring lands owned by the Federal Government has long been familiar to the producers in the Rocky Mountain states. Recent decisions of the Supreme Court of the United States have placed the tidelands, with their very important resources, under the same ownership. The tidelands and the government lands in the western states combined, will doubtless prove to contain a large portion of the undiscovered oil resources of the United States. For that reason, the future well-being of the oil producing industry in this country will depend on the extent to which laws governing leasing and operation of these lands approximate the terms and freedom of action obtainable from private owners. Imposition of greater restrictions and more red tape will drive us in the direction of those countries in which government attempts to operate the oil producing industry, and fails. With the minimum of regulations and restrictions by government consistent with proper conservation and with payment to the government of commensurate royalties, the future would appear bright. There can be no doubt as to the course for which we all should work, for greater freedom of action will benefit all of us, including government, itself.

Given the services of a proper weather-maker, in the shape of informed public opinion, to dispel these two clouds the American oil producer in his own country can look forward to fair weather in his industry. This climate, while not creating new oil resources, will aid in their conversion to reserves and will keep our chicken producing the golden eggs of prosperity for all of us. * * *


## These men are working for you



J. D. Mattimore, intense, soft-spoken Chief Engineer, Tube Turns' Product Engineering and Research Division.

Meticulous, scholarly A. R. C. Markl, Chief Research Engineer, Product Engineering and Research Division.

Thorough, analytical Arthur McCutchan, Chief Product Engineer, Product Engineering and Research Division.

T. D. Bridge, quiet, studious Product Engineer, Product Engineering and Research Division.

LIKE MOST U. S. manufacturers, Tube Turns, Inc. is sincerely determined to bring its customers the finest products possible. Fulfillment of that purpose is largely the responsibility of its research and product engineers.

No general practitioners, these men are recognized piping authorities, possessing highly specialized knowledge and training in the field of piping engineering. Together, they represent a total of more than 100 years experience in the design and application of piping, fittings, and flanges for power, oil, chemical, marine, and general industrial service.

Aided and abetted by a corps of trained technicians, their efforts are consistently directed toward one never changing goal: *better welding fittings and flanges to serve you better!*

*Are you on the mailing list?*

If you are concerned with designing or erecting piping systems, you'll want to receive new "Piping Engineering" bulletins. Just write us on your business letterhead, giving name, title, address.

"Be Sure You See The Double tt"

**TUBE TURNS, INC.**

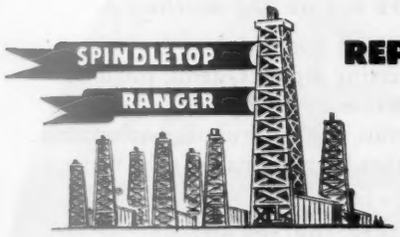
LOUISVILLE 1, KENTUCKY

YOUR SUPPLY STORE

# From SPINDLETOP to SCURRY

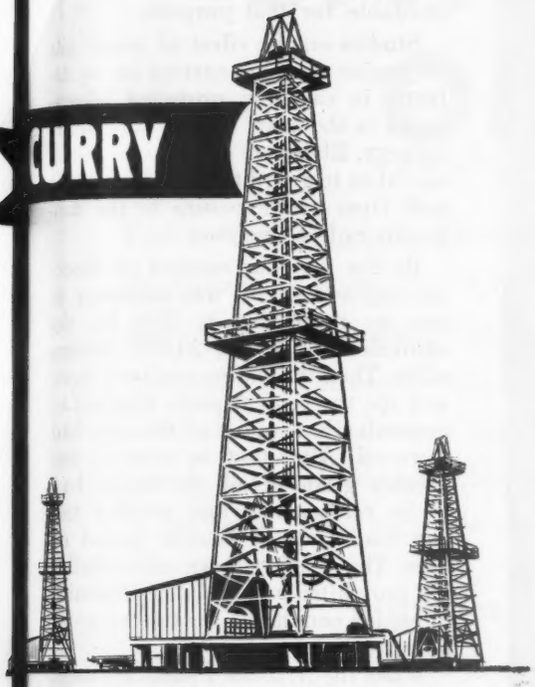
1920
REPUBLIC WAS there

1930
REPUBLIC IS STILL there




1910
REPUBLIC WAS there

40 years of service to the Oil Industry
Today . . . . . from 54 Points




EPUBLIC IS there

1940

1950

in

1960

REPUBLIC WILL BE there!

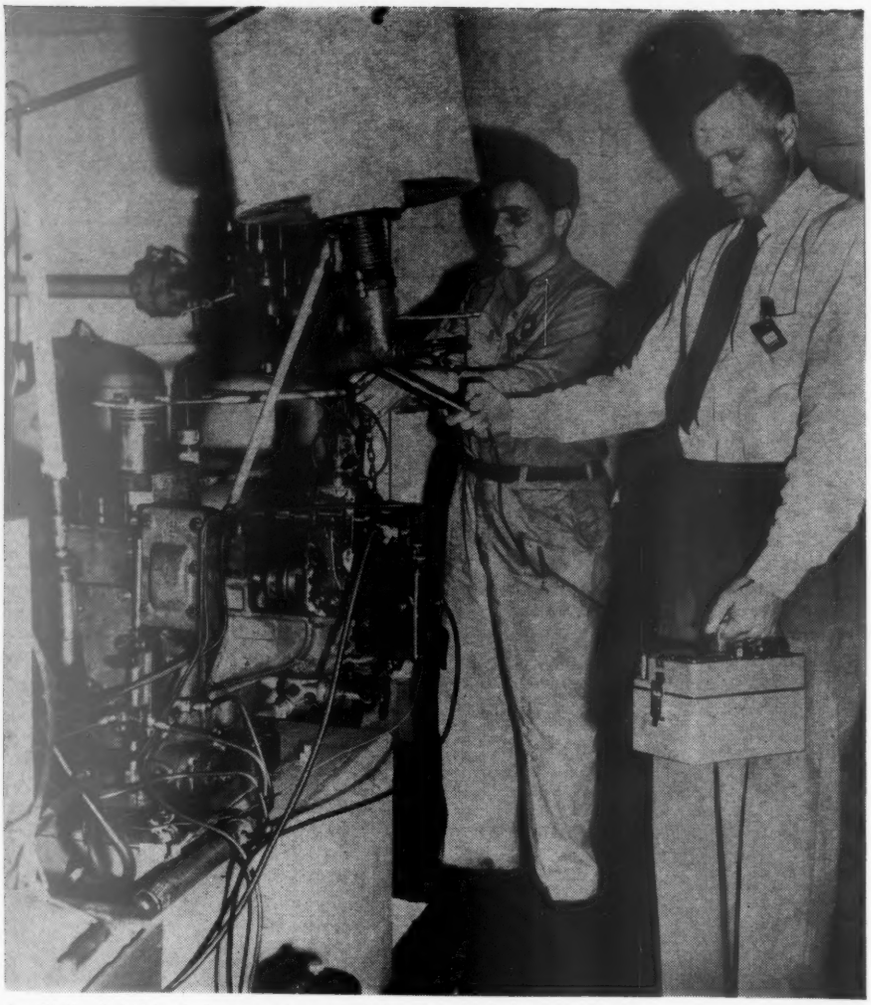
40th

*Anniversary*

# Republic Supply COMPANY

GENERAL OFFICES • • • HOUSTON 1, TEXAS

**TEXAS:** Houston, McAllen, Corpus Christi, Victoria, Alice, Falfurrias, Hebbronville, Pleasanton, Kilgore, Talco, Electra, Wichita Falls, Pampa, Abilene, Borger, Nocona, Olney, Big Spring , Odessa, Sundown, Kermit, Snyder, Fort Worth, San Antonio, Dallas, Amarillo, Lubbock, Midland, Freer. **OKLAHOMA:** Tulsa, Seminole, Oklahoma City, Cement, Elmore City, Bartlesville; **LOUISIANA:** Shreveport, New Orleans, Rodessa, Haynesville, Harvey, New Iberia, Lake Charles; **ILLINOIS:** Salem, Grayville, Fairfield, Chicago; **KANSAS:** Wichita, Russell, Ellinwood; **ARKANSAS:** El Dorado; **NEW MEXICO:** Hobbs, Artesia; **MISSISSIPPI:** Jackson; **WYOMING:** Casper;



At Philadelphia laboratories of Atlantic, Clifford J. Wirth uses tongs to lessen exposure as he installs an engine part made radioactive in atomic pile while Hugh R. Jackson checks amount of radiation with Geiger counter.

# Atomic Energy Is Latest Petroleum Research Tool

PROOF that atomic energy may benefit as well as menace civilization is supplied by its successful use in an advanced program of petroleum research now under way in the Philadelphia laboratories of The Atlantic Refining Company.

The company reports that its scientists, working with engine parts made radioactive in the atomic pile at Oak Ridge, Tennessee, have made great improvements over the previous method of measuring the effect of different motor oils on the wear in automotive engines. They are carrying on this research with the cooperation of the Atomic Energy Commission.

In a short period of engine operation, they can now determine accurately the exact amount of radioactive iron particles that have been worn from the engine and calculate immediately the extent of damage. This is done by measuring the radioactivity of the used oil that contains these particles. The speed and accuracy of this test opens the door to great progress in the constant research to improve the quality of motor oils, it was stated.

Atlantic was a pioneer in the use of atomic energy in petroleum research and in 1943 was granted a patent on this method by the United States government. The company's first experiments in this field were made with a cyclotron, long before the atomic pile at Oak Ridge became available for that purpose.

Studies on the effect of motor oils on engine wear are carried on by Atlantic in carefully protected laboratories in the heart of its Philadelphia refinery. Elaborate safety precautions are taken to guard the members of the staff from over-exposure to the dangerous radioactive rays.

By the previous method of checking engine wear, it was necessary to run an engine up to 500 hr, the equivalent of about 20,000 driving miles. Then the engine was torn down and the the critical parts weighed to determine how much of the iron had worn off. After that, in order to test another grade of oil, the engine had to be reassembled and another test run made over a similar period of time. This tearing down and rebuilding prohibited an absolute uniformity of engine conditions for the two comparative tests.

When the irradiated parts are used, the test is made on the oil and not on the metal. The advantages of this method are striking.

The engine need be run for only about 3 hr, or approximately 200 driving miles. Two oils can be tested in the same engine with an exact duplication of operating conditions. Thirty tests can be made in the time needed for one test by the previous method, thus greatly speeding up the research program.

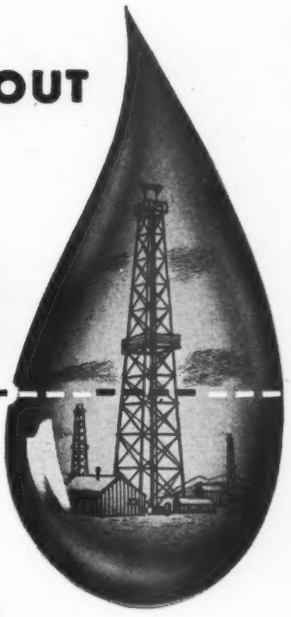
When the test run is completed, a metal cylinder containing a Geiger counter is dipped in the oil sample. This instrument immediately records the amount of radioactive iron particles suspended in the oil and fixes with accuracy the extent of wear.

Under the terms of its contract with the Atomic Energy Commission, Atlantic receives irradiated engine parts from Oak Ridge each month. The radioactivity of the parts decays so rapidly that they can be used for testing purposes for only three weeks.

The engine wear research is directed by Hugh R. Jackson, one of three Atlantic scientists who have completed a course in the safe techniques of using radioisotope tracers in research at the Oak Ridge Institute of Nuclear Studies. The others are Dr. Samuel W. Levine and Dr. John H. Ramser, who are studying other applications of atomic energy in petroleum research. * * *

## WE CAN ANSWER YOUR QUESTIONS ABOUT

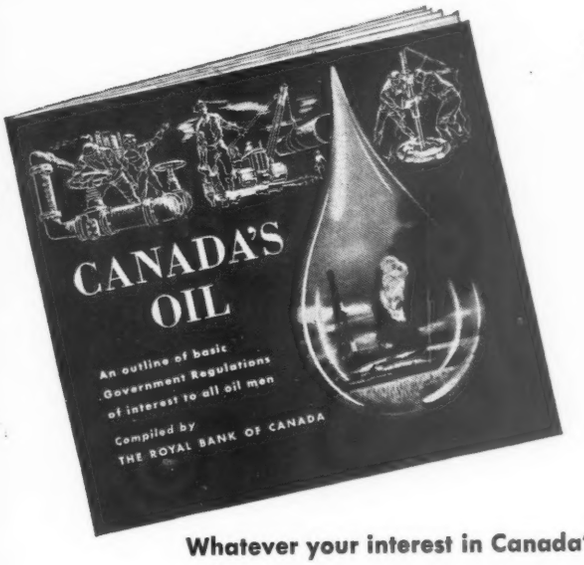
# CANADA'S OIL FIELDS



Out in Western Canada, The Royal Bank of Canada is known as "Canada's Oil Bank." Naturally enough! We have been operating in Canada's western oil fields since the earliest days of development, know the oil fields and the men who work them. Our branches in Calgary and Edmonton are rich sources of information for operators, equipment manufacturers and all who have a direct or indirect interest in Canada's phenomenal oil development and future potentialities.

**Branches Serving Alberta's Oil Areas**

**Calgary • Edmonton • Leduc • Devon • Turner Valley • Redwater**




This new brochure "Canada's Oil" has been prepared by The Royal Bank of Canada, to provide basic information for oil men interested in Canada's oil fields. Factual, comprehensive and up-to-the-minute, it covers such important subjects as — Leases and Reservations — Conservation and Proration — Business Operations in Canada — Taxation — Customs Regulations — and many others. Also contains maps of Western Canadian oil fields.

*Copies are available on request to the Advertising Department, Head Office, Montreal. Please write on your business letterhead.*

**Whatever your interest in Canada's oil fields, address your enquiry to:**

**E. B. Durham, Supervisor The Royal Bank of Canada, Calgary, Alberta**

*We do not provide information on oil securities*

# THE ROYAL BANK OF CANADA

Over 740 branches in Canada, the West Indies, Central and South America; New York, London and Paris. Head Office, Montreal

*Canada's "Oil" Bank* **ASSETS EXCEED $2,334,000,000**

# PETROLEUM PROFILE

Lewis W. MacNaughton
of DeGolyer and MacNaughton

THE story of the life of Lewis W. MacNaughton, of Dallas, Texas, should provide a lot of encouragement to young geologists and oil men, particularly those who, like "Mac," were not endowed with worldly goods but have had to climb the ladder of success from the bottom rung.

He was born April 23, 1902 on the Isle of Pines in the Caribbean Sea, the son of a Spanish American War veteran. The MacNaughtons moved to Cuba, on to California, New Jersey, Connecticut, and New York before settling down at the town of Saugerties, New York. His father, among other things, worked as a railroad section foreman.

As a youngster "Mac" became interested in the collection of fossils, minerals, and rocks, under the guidance of the Reverend Thomas Cole, a 65-year-old Episcopal minister, who made a hobby of teaching geology to a small class of boys. After about five years of lectures and field trips, he decided to make geology his profession.

He entered Cornell University after working in a paper mill a year to save the necessary money. He worked his way through, majoring in geology. Standard Oil Company of Venezuela gave him a vacation job in the summer of 1922, mapping the Orinoco delta country and exploring for salt domes.

When "Mac" graduated in 1924, the American Museum of Natural History in New York offered a cataloging job along with field studies of glacial deposits. He took it, but a year and a half at that job was enough for him.

With $100 in his pockets he went to the railroad station and tried to buy a ticket to the California oil fields. Chair car passage was $125. A ticket seller went into "deep consultation" with him, and he settled for a boat ticket to Galveston, which cost a little less than $100. "Mac" lost no time in looking for a job in Houston after the steamer landed at Galveston on March 11, 1926. The next day he was advised to see Wallace Pratt, and succeeded in signing up for field work with the Humble Oil Company in the East Texas area.

Everett DeGolyer of Tulsa, president of the Amerada Petroleum Company and its affiliate, Rycade, was looking for a geologist in 1928. He is noted for selecting "up-and-coming" assistants, so "Mac" became Rycade's geologist at its headquarters in Houston. In 1930 he joined Amerada as district geologist, first at San Antonio, then at Houston. It was that association that shaped his career.

When DeGolyer opened consulting offices in Dallas in 1936, he invited the young geologist to share his space and carry on appraisal work separately. On January 1, 1939, however, the firm of DeGolyer and MacNaughton came officially into existence. John H. Murrell, who was one of the mainstays in West Point's backfield at one time, is the third partner today.

DeGolyer and MacNaughton are represented in the management or on the boards of oil and gas producing companies, utilities, banks, trusts, and research foundations throughout the country.

"Mac" has not been too busy in his 100,000-mile per year travels to find time for organizing new ventures and to take care of the many challenging assignments that are his as a member of the firm. He has made many flights from Dallas to Fairbanks, Alaska, where he serves as a consultant on oil exploration work for the Navy on its 35,000 sq mi reservation near Point Barrow. He also flies to Venezuela, Brazil, and other countries whenever the need arises.

One of his most interesting recent adventures is his part in the organization of the Great Plains Development Company of Canada, Limited. This enterprise was termed "strictly a gamble" yet $10,000,000 worth of stocks and bonds was oversubscribed.

A quote from the prospectus is typical of the kind of adventure that "Mac" now heads as president of Great Plains: "This is an enterprise which involves considerable risk. It may also require patience, as the company intends to proceed deliberately in the early stages of its operations and at all times to accept undertakings only on the basis of detailed preliminary study."

The fact that so many people desired to invest money in this new company, which admittedly had no holdings of any kind in Western Canada or anywhere else at the time of its organization, is in itself one of the greatest tributes that could be paid to any geologist or oil man.

Lewis MacNaughton has come up from "the other side of the tracks" to prove that ability, patience, perseverance, and integrity can be a man's most valuable assets.

# Economics of Canadian Production

UNTIL the discovery of prolific quantities of oil and gas in the Devonian reef limestone at Leduc in 1947, Canada's proved reserves were less than 100,000,000 bbl, and more than 90 per cent of its petroleum requirements were imported from the United States and the Caribbean area. Now, however, the proved reserves of Western Canada are estimated to be from 1,000,000,000 to 3,000,000,000 bbl by various authorities, and Canada's current petroleum requirements can be met by the producing capacity developed in the new reef and cretaceous sand fields as soon as enough oil can be transported via the Great Lakes to Eastern Canada, which contains about 60 per cent of Canada's population and petroleum demand.

The present price of crude oil in Western Canada's new fields is about $3.25 (Canadian) per bbl, which compares with about $5 per bbl for Mid-Continent crude laid down at Regina. When Western Canada's oil begins to move East, it is probable that the field price will have to be adjusted downward to pay for the transportation and thus make Western Canadian Oil competitive with U. S. and Caribbean oil laid down at the Eastern Canadian refineries at Sarnia, Toronto, and Montreal. A reduction in field price of as much as $ .50 to $1 per bbl is indicated unless transportation costs are less than anticipated, or unless the price of U. S. and Caribbean oil at those points is raised. Most Western Canadian producers recognize the fact that an adjustment in field price may occur as the new 70,000-bbl-per-day line to Superior begins to operate; however, some are hopeful that no change will occur unless it is upward.

Although Saskatchewan and the Northwest Territories have a few oil fields, Alberta has enjoyed the most rapid discovery and development of new fields since Leduc was discovered. A recent report indicates that Alberta now has about 1750 oil wells compared with some 1085 as of October 1, 1949. Although the present wells are producing only about 86,000 bbl per day, they could more than triple this rate without exceeding their "maximum efficient rate" as determined by the Alberta Conservation Board.

Every new discovery and extension well adds to the number of proved locations that should be drilled. The recent flurry of new Devonian reef and Cretaceous sand discoveries indicates that more than 1000 wells remain to be drilled. At the present rate of development drilling, it may take 3 or 4 more years to delimit some of the fields like Normandville, Whitelaw, Redwater, Leduc-Woodbend, Excelsior, Bon Accord, Stettler, Joseph Lake, Acheson, Stony Plain, Camrose, and Big Valley—and dozens of new fields may be opened in that time by the high rate of wildcat drilling.

Western Canada's 800,000-sq mile sedimentary basin is only on the threshold of its ultimate development for oil and gas.

K Marshall Fagin

# "Whirling on center" is the key to Cementing Success

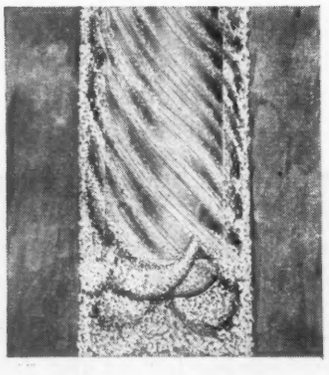
NO OTHER EQUIPMENT—no other method of cementing—provides such assurance of successful "first-time" cementing as the exclusive Baker Principle of "whirling" the cement up and around casing which is effectively centered in the well with Baker Model "G" Casing Centralizers.

Not only can you REMOVE BRIDGES which might stick the casing; not only can you wash the wall of the hole to help REMOVE MUD CAKE and leave the formation prepared for effective bonding with the cement to follow, but the definite *downward*, then *upward* whirling motion of the cement slurry REDUCES THE HAZARD OF CHANNELING TO A MINIMUM, and assures COMPLETE ENCASEMENT OF THE PIPE at the critical shoe joint with a uniform body of cement.

Study the illustrations below for visual proof of what "whirling" means to you.

**The downward hydraulicking action of the circulating fluid through the baffled side down-whirler ports, and the nozzle-like bottom passageway, effectively remove bridges and permits safe running of the casing string.**

**When washing the formation at the cementing point to condition the hole, the "whirling" motion of the fluid helps remove mud cake from side walls. This *downward* whirling is far superior to any *side* jetting action, and does not cause caving or crumbling of soft formations.**



**The "whirling" motion given to the cement slurry as it is discharged from a Baker Wash-Down Whirler Shoe causes the cement to encase the centered shoe joint with a uniform body of cement, and reduces to a minimum the hazard of channeling.**

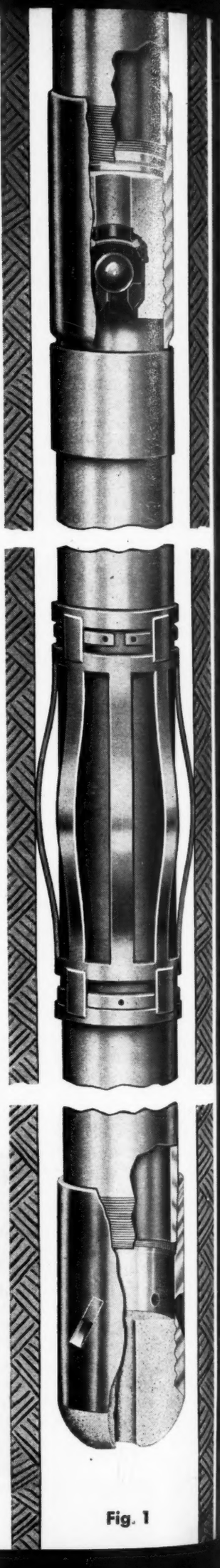
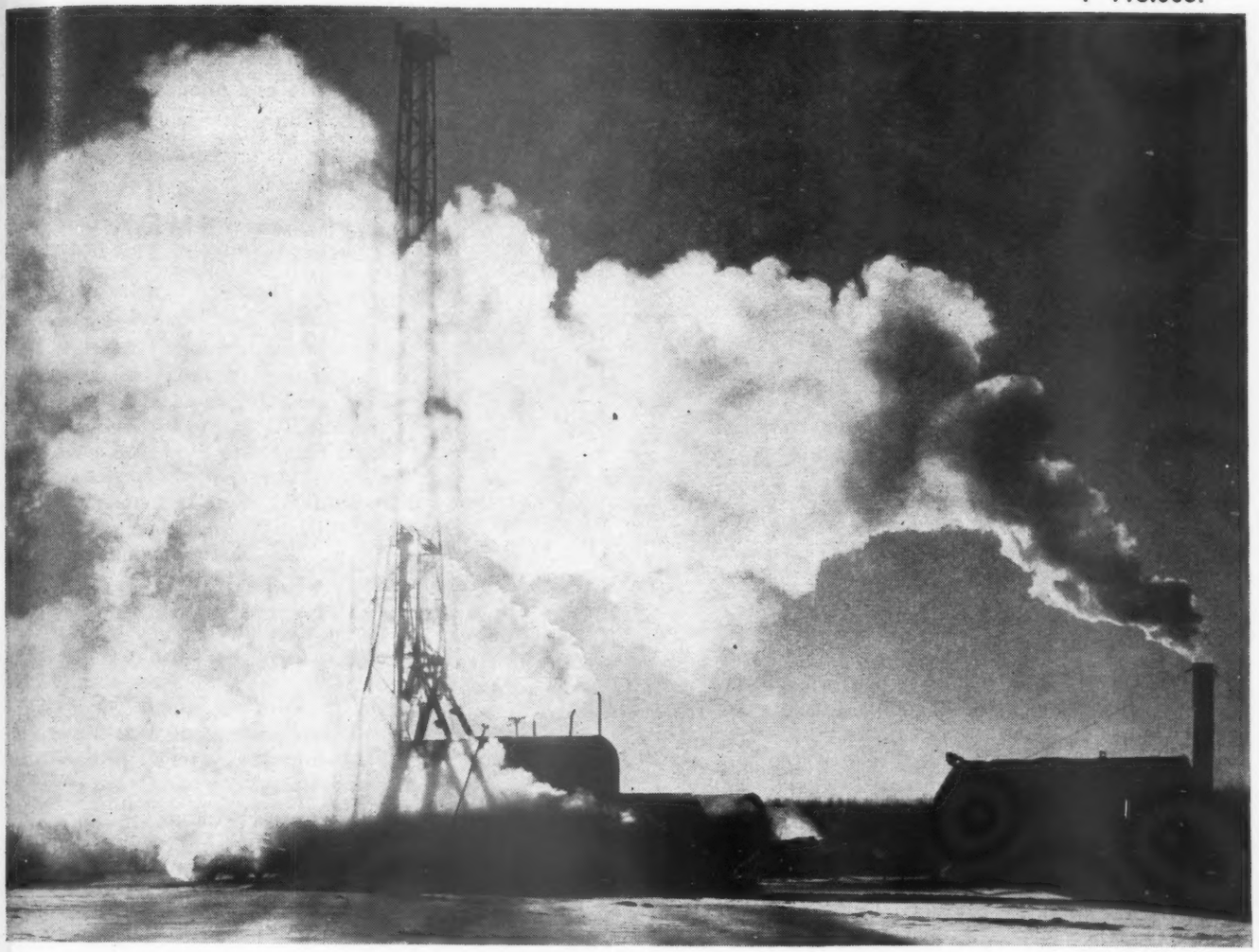


**Fig. 1**



*Imperial Oil, Ltd. photo*

Winter operation of a mechanical rig requires an auxiliary low pressure boiler for heating purposes.

# New Oil and Gas Fields of Western Canada

*A steady increase in drilling is forecast as development continues and discoveries expand exploration in this huge sedimentary basin.*

K. MARSHALL FAGIN*

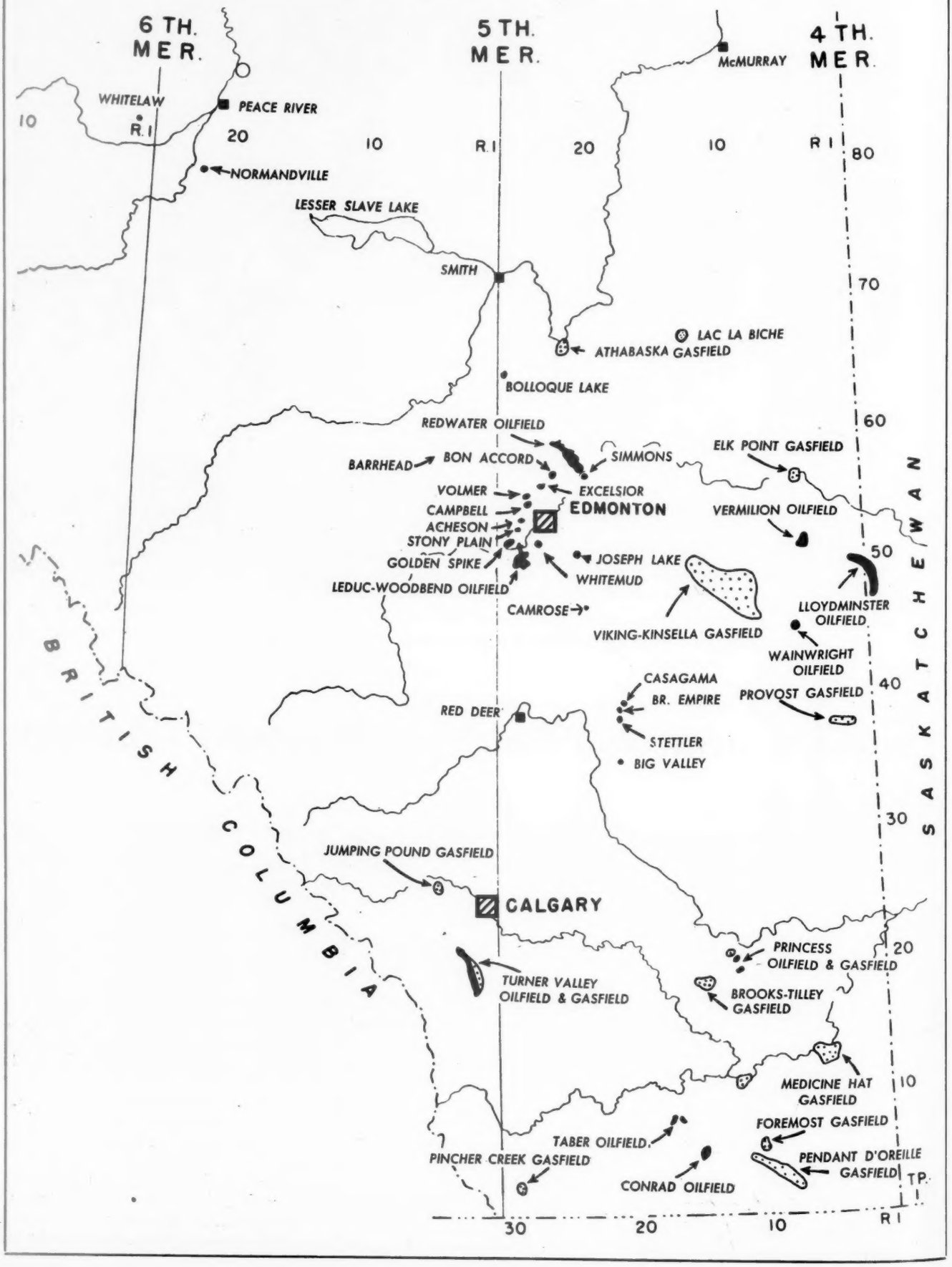
ALTHOUGH the development of the prolific Leduc-Woodbend and Redwater fields near Edmonton has overshadowed the drilling and production activity in other parts of Western Canada, the rate of development of these two fields, particularly Redwater, is expected to decline in 1951 as the producing limits are determined. The rate of Western Canadian development as a whole, however, is expected to increase considerably as dozens of new discoveries and extensions are made, and as the new pipe line from Edmonton to Lake Superior provides a larger market for Western Canada's new oil producing capacity. New outlets for natural gas production are also expected to materialize and result in additional development of many of the areas proved for natural gas production.

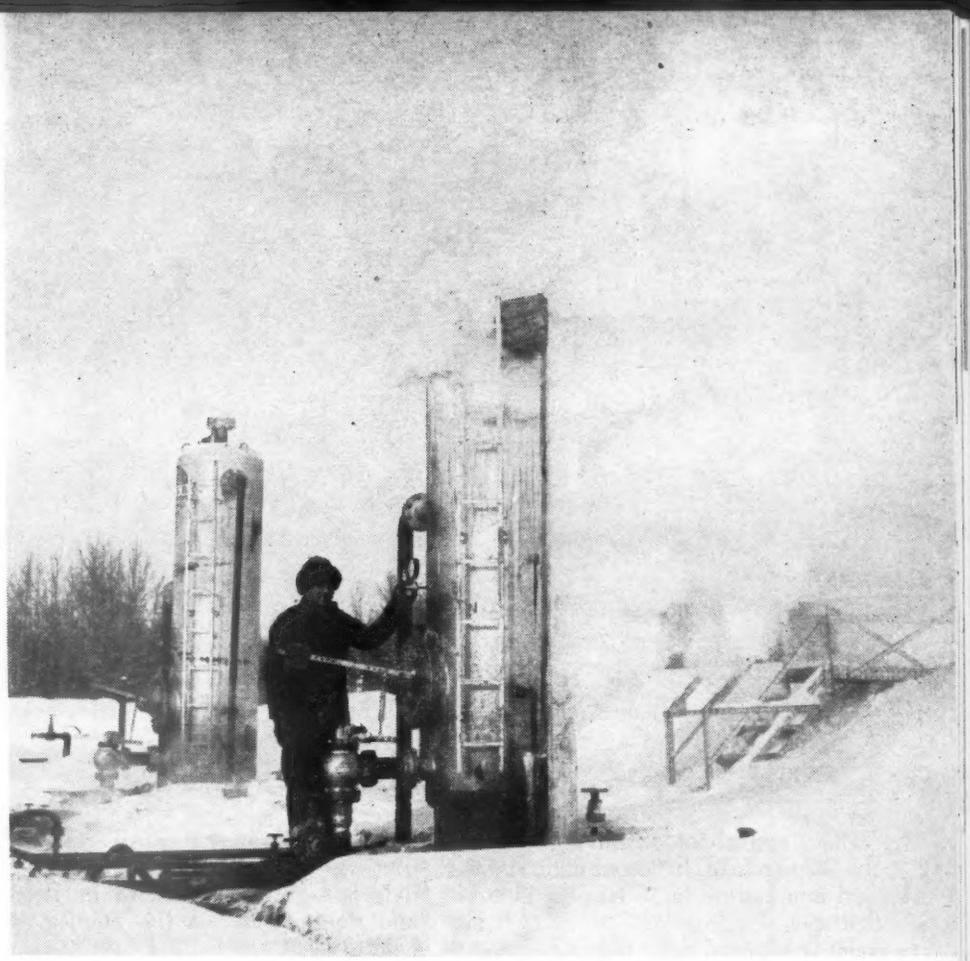
The strategic importance of Western Canada's new oil and gas fields in the event of a third World War provides another spur to the present widespread search for more fields and to the full development of those already found. Petroleum exploration has been centered principally in the Province of Alberta since the discovery of Leduc in 1947, however, it is expected to spread gradually over entire Western Canada sedimentary basin, which extends from the International Boundary northwestward 1800 miles to the Arctic

*Editor, Drilling and Producing.

EXCLUSIVE

**The New Oilfields of Western Canada** . . . centered around Edmondton in Alberta Province, stretch from Norman Wells (not shown), which is in the Northwest Territories near the Arctic Circle and about 800 miles north of Normandville, to Pincher Creek near the International Boundary.





Operator turns on steam jet to thaw out gas line of separator at Joseph Lake field lease battery during subzero winter weather.

*Imperial Oil, Ltd. photo*

coast from the Rocky Mountains on the west to the Precambrian shield on the east.

### Huge Prospecting Area

This great Western Canada sedimentary basin contains more than 800,000 square miles of land that might produce oil or gas. Oil and gas fields have now been discovered from the International boundary to Norman Wells, a distance of about 1500 miles. Sedimentary rocks have been drilled to depths of more than 14,000 ft in the foothills area of Alberta, which is believed to contain 20,000 ft or more of such rocks. The sediments thin out gradually toward the Precambrian shield on the east.

The discovery of the prolific Devonian reef type fields in the Edmonton area has stimulated a widespread and intensive search for similar Devonian fields. The search is leading incidentally to the discovery of a number of oil and gas producing fields in the Viking, Cretaceous, Jurassic, and Triassic sands and the Mississippian (Madison) limestones that are usually penetrated above the Devonian.

### New Discoveries

Three new Devonian reef fields of considerable importance have been discovered recently in the 1950 exploratory drilling campaign. California-Standard's Acheson field discovery well, 8 miles west of Edmonton and about 4 miles northeast of Imperial's discovery at Stony Plain, found the D-3 reef zone of the Devonian at 4969 ft, or about 122 ft higher than in the Stony Plain discovery well. The Acheson well is now being completed in the 121-ft producing section penetrated without reaching the water level.

The size and importance of this new reef build-up is yet to be determined by future drilling. Some are reported to believe that the Acheson field may be very small. Others think the field may cover more than 3200 acres, enough for 80 or more wells in the prolific D-3 zone of the Devonian. There are also good prospects of developing oil production from the D-2 zone of the Devonian and the higher Cretaceous sands. Such developments might double or triple the number of wells to be drilled.

The Camrose field discovery well, Flint No. 1, has indicated a producing capacity of about 700 bbl per day from drillstem tests of about 30 ft of D-2 zone pay discovered below 4505 ft. The well is now coring at 4819 ft in search of production from the D-3 zone, which should be found near that depth. This well is about 12 miles southwest of the town of Camrose and about 40 miles southeast of Leduc field. The size and importance of this field likewise remains to be determined by future drilling.

The Big Valley field discovery well, Canadian Gulf Oil Company's Big Valley No. 7, is situated about 80 miles northeast of Calgary, about 4 miles southwest of the town of Big

Marsh funnel viscosity of drilling mud is determined during winter operations at a wildcat well in Western Canada.

*Imperial Oil, Ltd. photo*

A Can-Tex Drilling Company rig drilling and coring through 7-in. casing below 10,100 ft on Shell-Anglo Canadian's Pine Creek No. 1, a wildcat east of the Turner Valley field.

Valley, and about 18 miles south of the Stettler field. It flowed natural gas in 4 min and oil in 15 min on 55-min drillstem test from 5237 to 5252 ft in what is believed to be the D-2 zone of the Devonian formation.

The well had previously flowed natural gas on drillstem tests of the Viking and Cretaceous sands. It is now being cored below 5252 ft in search of the D-2 water level. Drilling, coring, and testing of the deeper D-3 zone is expected before the discovery is completed. This is Canadian Gulf's third important discovery in Alberta. The first was the deep Pincher Creek gas field in southwest Alberta in 1948, and the second was the Stettler oil field in 1949.

### Exploration at Peak

More than 40 companies are now operating about 120 geophysical crews in Western Canada. This is about 25 more crews than were engaged last year, almost double the number engaged two years ago, and about triple the number of crews engaged three years ago. Seismograph crews in operation are at an all-time peak of 106, about 30 more than last year.

Two aero-magnetic units are now at work, one in northwest Alberta, and the other in both Alberta and Saskatchewan. Twelve gravitymeter crews are now at work compared with about 25 a year ago.

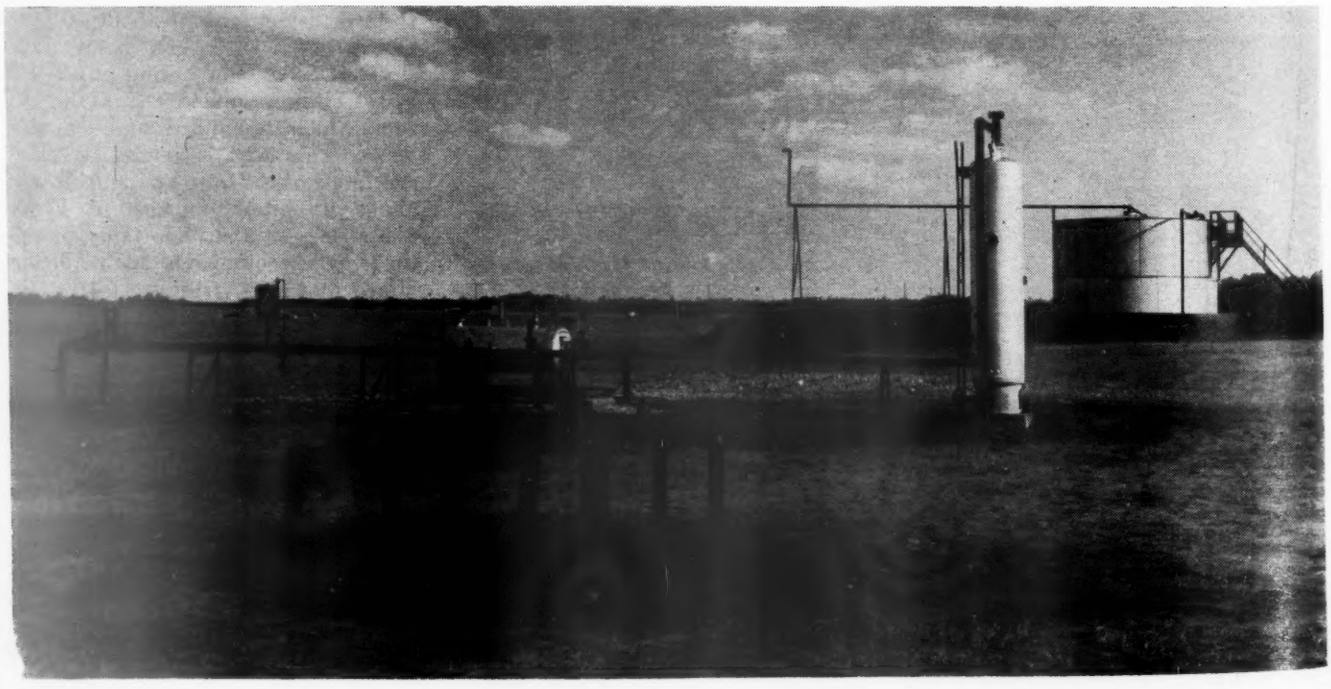
The geophysical crews are operating throughout the Western Canada basin from Manitoba to the Northwest Territories. About 90 crews are operating in Alberta, 27 in Saskatchewan, and 3 in Manitoba. The continued discovery of new fields throughout the basin is expected to increase the geophysical activity, and the weather is expected to have less effect on the activity as the crews and equipment are better prepared for winter operations.

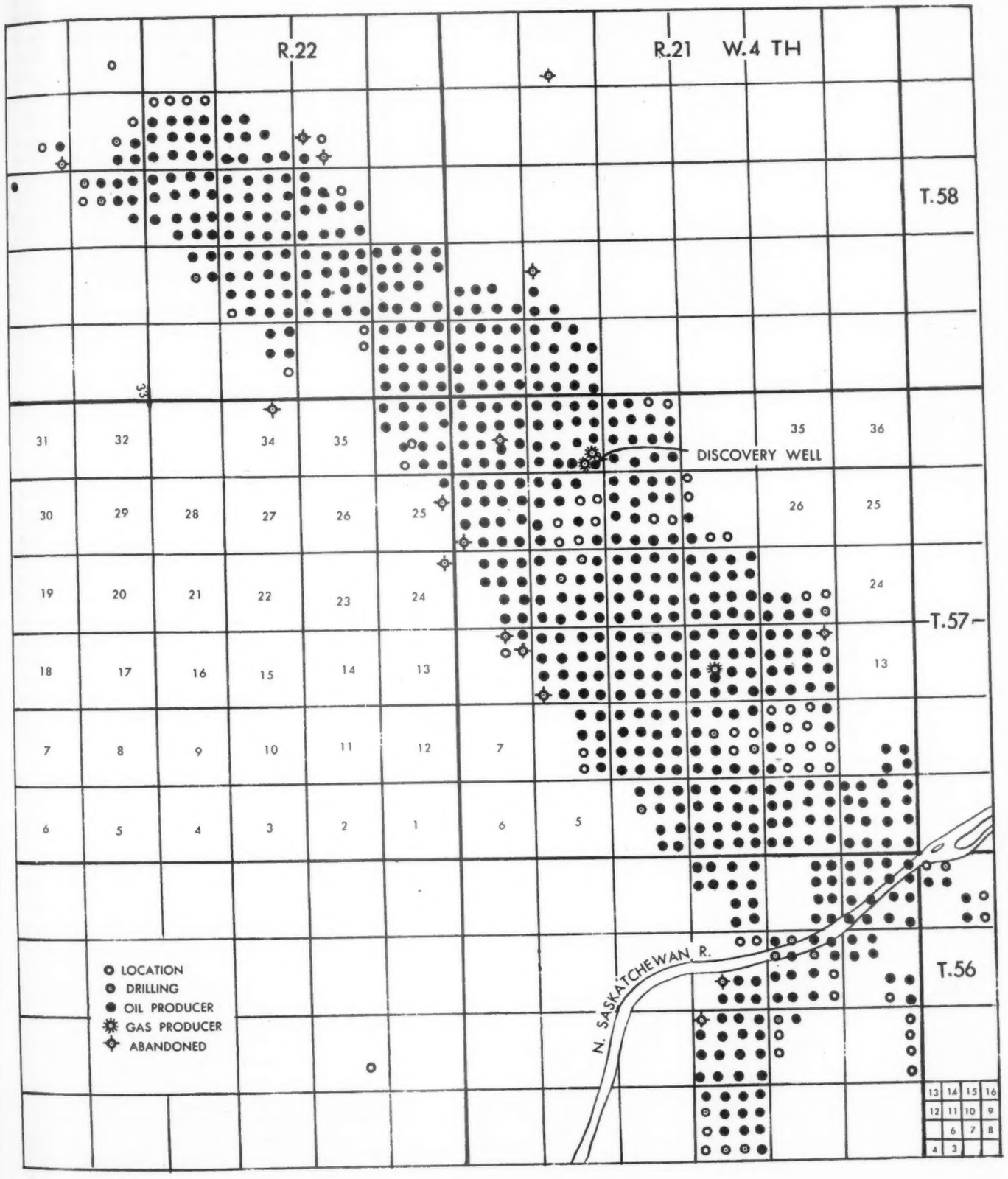
### Drilling Activity

The rate of development in Western Canada increased steadily after the discovery of Leduc in 1947 until June 1949, when about 60 rigs were engaged in development drilling and 52 rigs were working on wildcat tests. Activity declined last winter, however, it increased to the 1949 level about July. Some 125 rigs are now operating, however, some of these may be forced to suspend operations soon due to the recent railroad strike or to the advent of winter weather.

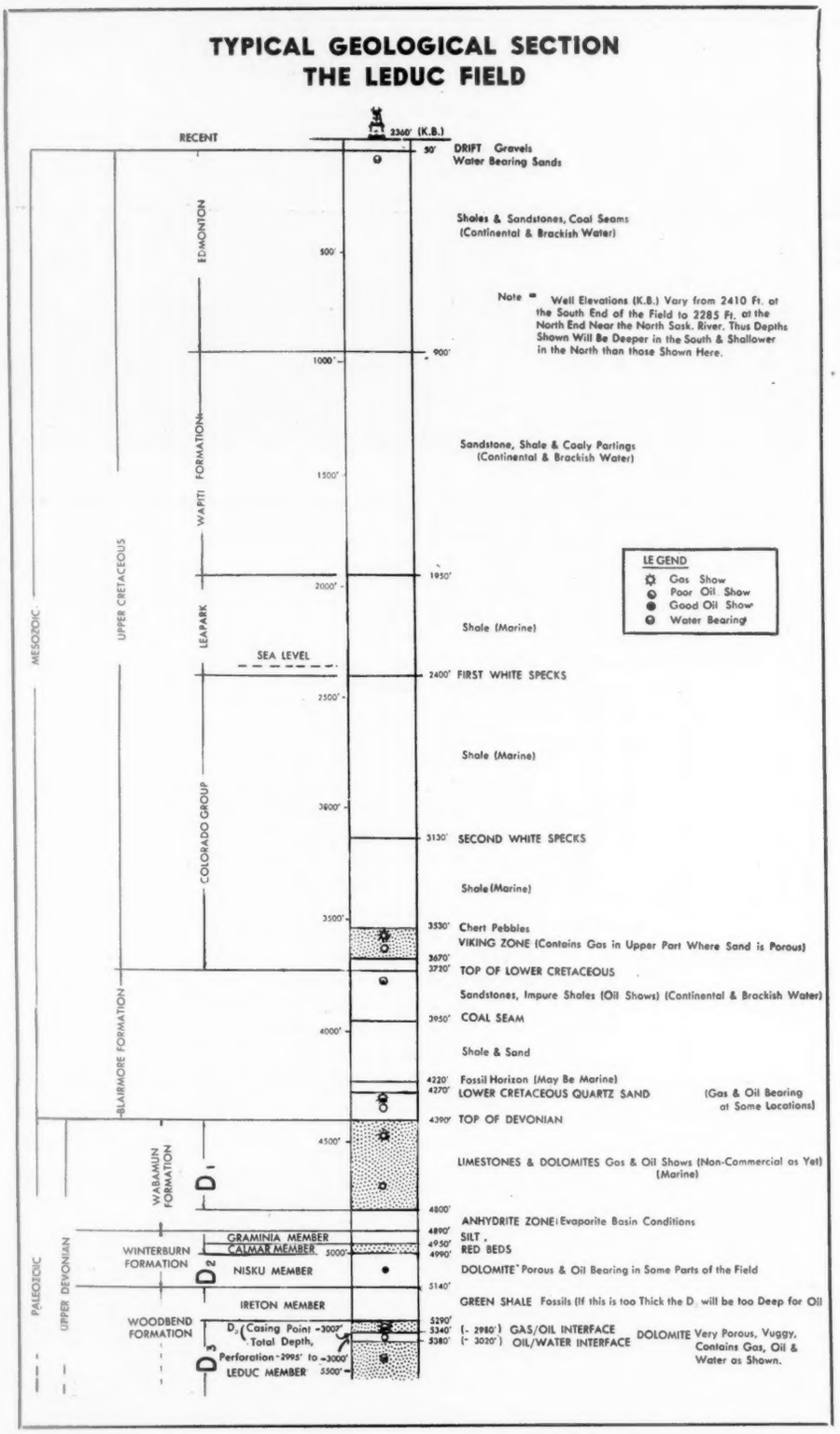
An auxiliary steam boiler is necessary to supply heat on the mechanical

One 125 psig, 3 x 11 ft separator, an individual well testing unit (center), and two 1000-bbl bolted, galvanized iron tanks serve 16 wells on Canadian Gulf's Bigoray lease in Redwater field. Four-inch "trunk" flowlines from wells converge at the header (foreground). The system is designed to keep the oil moving during 30 to 50 below zero weather.






**The Redwater Oilfield of Alberta, Canada** is being developed on 40-acre drilling units from the D-3 reef zone of the Devonian limestone. Wells are being completed at a depth of about 3250 ft in a week or 10 days at a cost of about $20,000. Some 25 rigs are in operation at the present time with most activity in the south end of the field (Simmons area). About 600 wells have been completed thus far, and more than 200 proved locations remain to be drilled. A few lower cretaceous sand gas wells provide fuel for domestic purposes. Pumping units are being installed throughout the field as the pressure is declining slowly to the point where the wells will not flow after being shut-in. Note: The 40 acre subdivisions in each section are numbered in accordance with the example at the lower right.




rigs that are used almost exclusively in Canadian drilling operations. Most of the rigs are portable or semi-portable rotaries with diesel engines for operating the drawworks and slush pumps. Some rigs are equipped with natural gas or butane engines in areas where such fuel is available. Drilling operations are retarded by the low temperatures and occasional heavy snowfalls in Western Canada during the winter months.

Flamethrowers, blowtorches, steam, and various heating devices are needed to keep the rigs at work. The crews often have difficulty operating their automobiles during the 30 to 50 deg below zero weather that begins in December and persists until March.

More than 40 drilling contractors are now operating rigs in Western Canada, and more are gradually entering the country as the demand grows for new wells by the 130 or more operating companies. Most of the major companies in the United States are represented by Canadian subsidiaries in the growing activity in Western Canada. Many U. S. independents also operate there, however, most of the small operators in Canada are Canadians.

Almost all the equipment, service, and supply companies are represented in Canada. Calgary has the headquarters for many of these, however, Edmonton has the principal warehouses and field headquarters, which are within easy reach of most of the present operations.

### Redwater

The Redwater field, which is about 35 miles northeast of Edmonton, continues to hold the limelight as the largest field developed so far in Canada. The discovery well was completed on September 25, 1948 by Imperial Oil Company after penetrating 140 ft of D-3 zone pay in the Devonian formation between 3100 and 3250 ft.

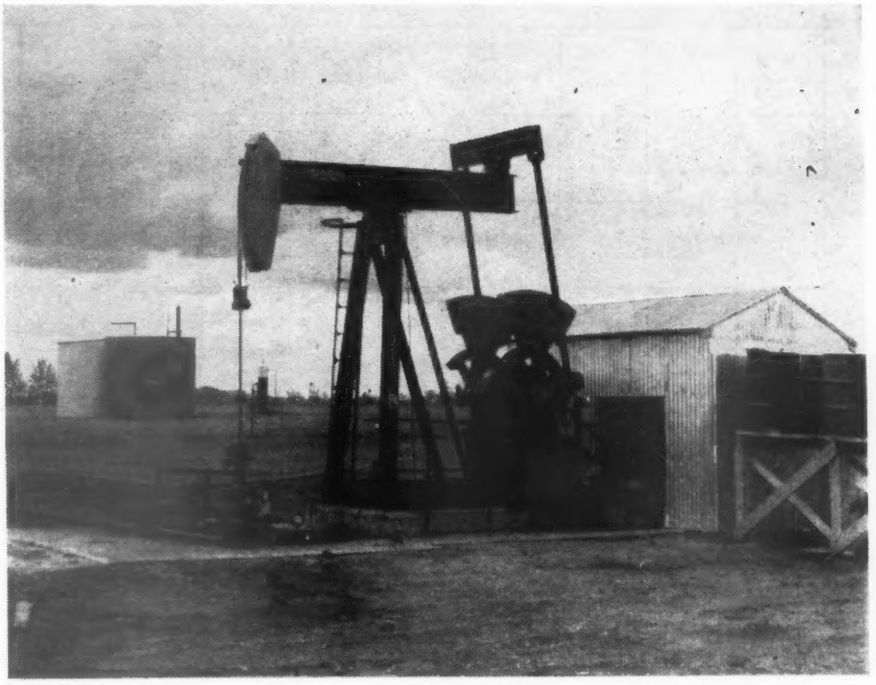
The field now has about 800 oil producing wells completed in this zone, which has a maximum productive thickness of about 207 ft. The initial production of the wells has averaged about 2000 bbl per day with a gas-oil ratio of 215 cu ft per bbl. The cumulative production is now about 10,000,000 bbl, and the wells are producing about 33,000 bbl daily under pipe line restrictions. The oil is 35 API gravity with about 5 per cent sulfur content.

The original bottomhole pressure was 1050 psig at —1165 ft subsea. The reservoir temperature is 94 F, and the pour point of the oil is about —15 F. The oil has a paraffin base.

Three small gas wells have been completed in the Viking and lower Cretaceous sands above the Devonian to supply fuel for domestic and heating purposes. The D-2 zone of the Devonian has not been found productive. Development of the D-3 oil producing zone is underway in the Simmons area on the southeast side of Redwater and in the northwest end of the field.

### A 640,000,000-bbl Reserve?

Redwater is now considered proved for about 800 wells on 32,000 acres, however, the actual extent of this prolific Devonian reef remains to be determined by further drilling. The ultimate production from the reef is now estimated from 100 to 200 bbl per acre-ft, or from 320,000,000 to 640,000,000 bbl, depending on the effectiveness of the water drive. Some of the edge wells are beginning to make considerable water, and the bottomhole pressure has declined already to the point where most of the wells are



Discovery well in the Bon Accord field, north of Edmondton, produces from the D-2 zone of the Devonian at 3592 ft. Gasoline (in drums at right) is used for pumping.

being put on the pump. About 6,000,000 bbl were produced with only a 60 psi pressure drop.

New wells are being completed in a week or 10 days. Drilling is not difficult, but rock bits are used most of the way. Surface casing is generally set about 600 ft with 275 sacks of cement. The 10¾-in. 40.5-lb pipe is set in a 13¾-in. hole. Some operators set the oil string on top of the D-3 producing zone and complete in open hole, while others set on bottom and perforate the pay with about 4 jet shots per ft.

About 350 sacks of cement are used on the oil string. Five-and-half inch casing is usually set in a 7⅝-in. hole, and 7-in. is set in a 9-in. hole. A guide shoe, float collar, 4 casing centralizers, and 4 scratchers are now being used by a company that sets through the producing formation.

### Low Mud Costs

The surface formations make mud as drilling progresses. Small quantities of commercial mud materials, including caustic and quebracho, may be added. About 25 sacks of sawdust or commercial lost circulation material is added to the producing zone. Less than $500 is usually spent for drilling mud materials.

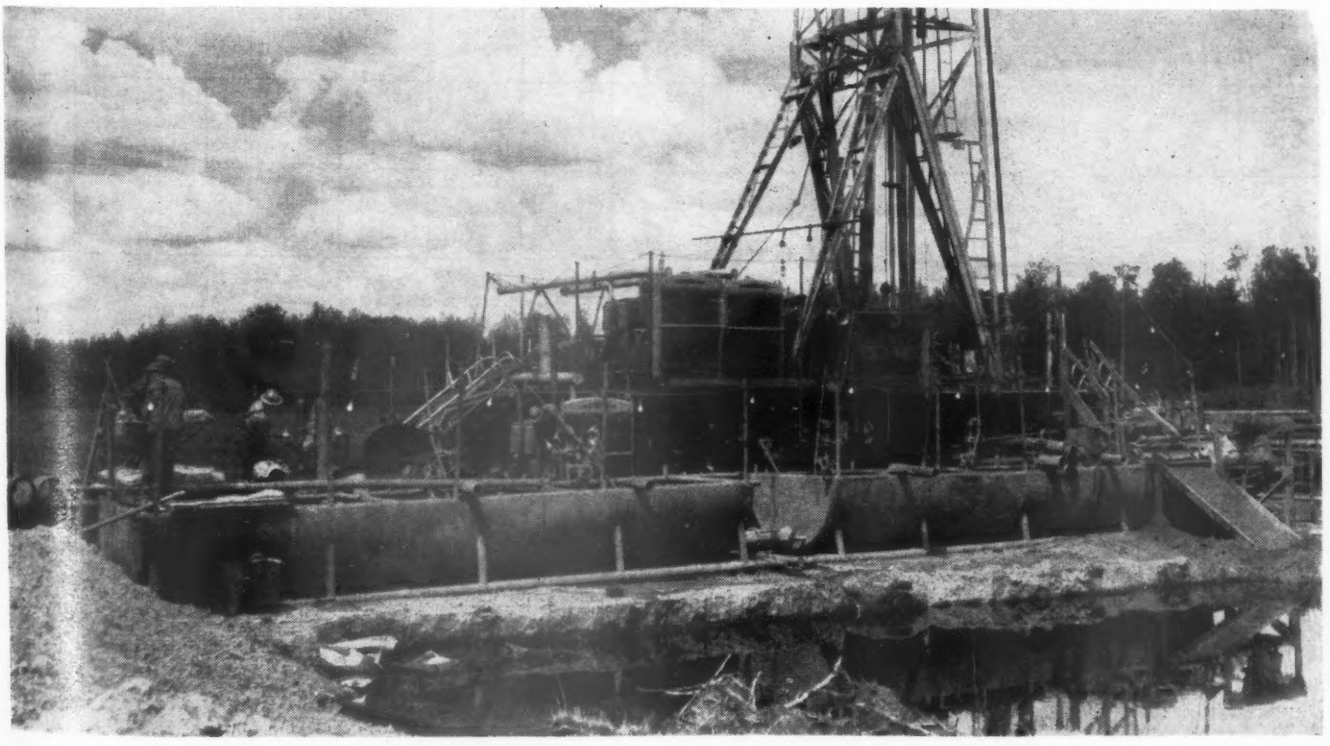
Redwater wells cost about $20,000, including diamond coring of the producing zone and 1000 to 5000 gal acid treatments. Canadian government electric power is made available at each well site, so the operators are installing pumping units equipped with 7 to 10 hp, 3-phase, 220/440 v, 1200 rpm electric motors. Paraffin scrapers are used on most sucker rod strings.

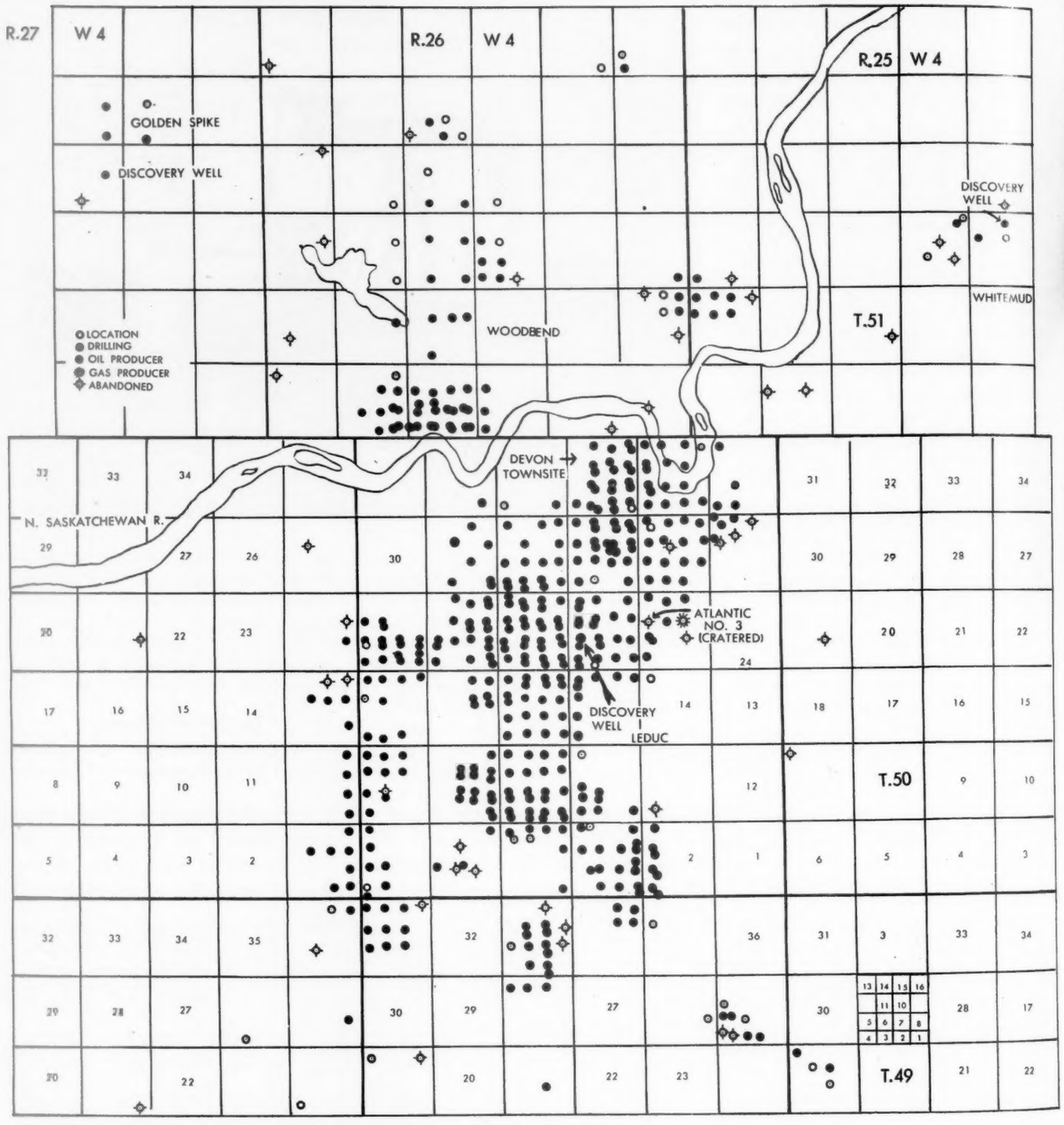
Most of the lease storage tanks and separators are of galvanized iron to combat the anticipated trouble with corrosion. One company is using a bronze liner on its polished rods.

### Leduc-Woodbend

The Leduc-Woodbend field, which is about 16 miles southwest of Edmon-

Three diesel engines operate this mechanical rig on well in the Excelsior field, north of Edmondton, being drilled for Dome Exploration (Western), Ltd. and Western Leaseholds, Ltd. The well showed for oil production on drillstem tests of the Viking sand (2721 to 2761 ft) and of the D-2 zone of the Devonian (3888 to 3915 ft). Note the interesting portable mud pit tanks made of riveted steel plates.






**The Leduc-Woodbend field of Alberta, Canada.**

The rich Golden Spike field (upper left) and the Whitemud field (upper right) are also shown on this map. Note: 40-acre subdivisions of a section are numbered in accordance with the example at the lower right.

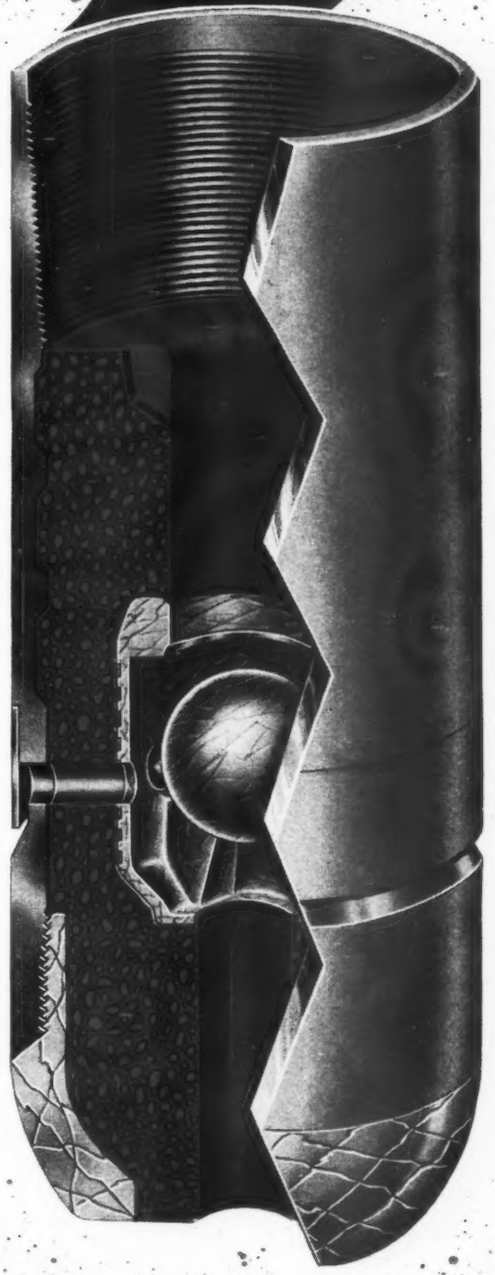
ton, is the second largest oil field discovered so far in Canada, and may produce more oil than Redwater. Imperial's Leduc No. 1, the discovery well, was completed February 13, 1947, for an initial flow of more than 900 bbl per day from 37 ft of open hole in the D-2 producing zone of the Devonian limestone from 5029 to 5066 ft. The well had flowed gas on a drill-stem test of the lower Cretaceous sand about 4300 ft deep at a rate of about 6,000,000 cu ft per day.

The gas-oil ratio was about 400 cu ft per day during the last part of the initial flow period. Casinghead pressure was 775 psig and tubinghead pressure was 240 psig during that period. Leduc No. 1 was the largest well ever recorded in Western Canada outside of Turner Valley at that time, and sparked the exploratory program that has meant so much to Canada since then.

The field now has about 450 oil wells completed in the D-2 and D-3 zones of the Devonian and in the Lower Cretaceous sand. The D-2 and D-3 wells are twinned on 40-acre drilling units wherever both zones are

# POSITIVE SIDE-ACTION SLURRY

## *WITH THE FIRST STROKE OF THE PUMP*



**Larkin Geyser Shoes are constructed so that fluid is discharged *with the first stroke of the pumps* from a "perfect circle" area-way which completely encircles the shoe, rather than from individual lateral or oblique ports. Part of the cement slurry is also discharged downward from the bottom port.**

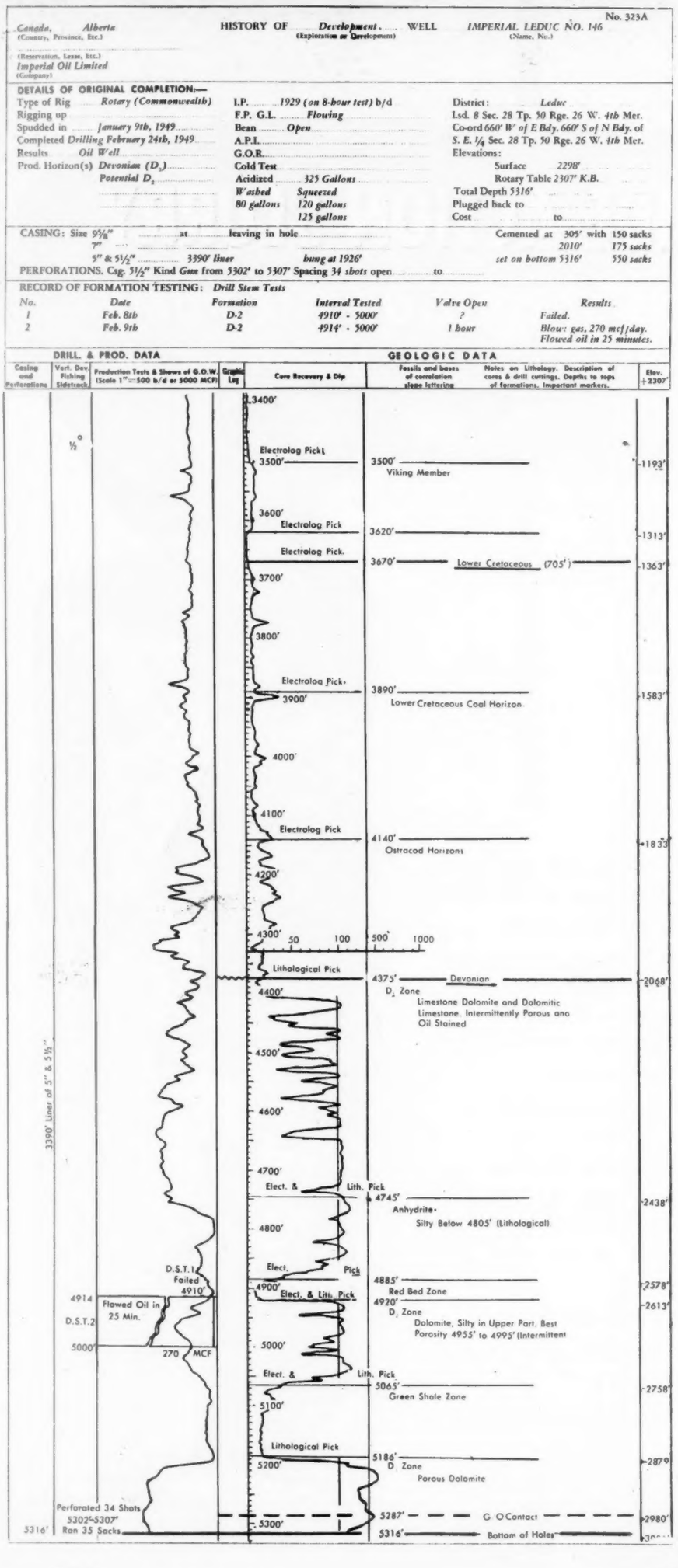
**This Larkin side-action slurry . . . widely accepted as standard equipment for cementing success . . . contributes everything possible for successfully landing and cementing casing: *it washes out cavings, bridges and other obstructions — it washes mud cake from the well bore — it distributes slurry evenly at the shoe point — it minimizes channeling.***

**So measure the value of your cementing equipment by what it will do. Buy Larkin floating and guiding equipment through your supply store.**

**LARKIN PACKER COMPANY, INC.** ST. LOUIS, MO.

LARKIN

...Through Your Supply Store




**A typical electric log of a Leduc D-3 well showing the various upper formations that may be produced in other wells on the same 40-acre unit.**

productive (see accompanying map). Only a few Cretaceous wells have drilled so far on such units. Flowing production from 4205 to 4211 ft in the lower Cretaceous was developed, however, in some wells in Section 7, T.51, R. 25 W of the 4th Meridian (North Leduc) by Continental Oil Company, when the Devonian failed to produce. The discovery well in this pool was completed near the end of 1948 at an initial flowing rate of about 10 bbl per hr of 38 API oil.

The Leduc-Woodbend field now covers about 25,000 acres, however, it is still being extended and final development may not be reached until some 900 wells have been completed. It is reported that 4 more years of drilling will be required to develop the locations that are now proved in the D-3, D-2, and other upper zones.

Unlike Redwater, the D-3 zone in Leduc has a gas cap above the oil as well as water below. The water level is irregular, being 10 ft or more lower on certain sides of the reef. The oil column is about 40 ft thick.

### 500,000,000-bbl Reserve?

Present estimates of the ultimate recovery from the Leduc-Woodbend field range from 375,000,000 to 500,000,000 bbl. The field has produced about 20,000,000 bbl to date, and slightly exceeded Redwater's rate of production last month by producing about 36,000 bbl per day from 443 wells.

The D-3 zone had an original bottomhole pressure of 1894 psig at — 3005 ft subsea. Pressures are about the same in all D-3 wells, because of good permeability in the D-3 reef pay, which includes the thick gas cap. The pressure dropped 50 psig throughout the reservoir as a result of the extended blowout of the wild Atlantic No. 3 well. The present bottomhole pressure in the D-3 is about 1800 psig.

The D-3 reservoir temperature is 152 F, and the pour point of the 41 API, sulfur-free, paraffin base crude oil is — 5 F. The average gas-oil ratio is about 760 cu ft per bbl.

### Blowout Control

The chief danger in drilling a well into the porous D-3 reef limestone in

# "You can't move 'em without D8s"

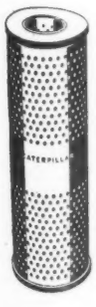
*T. R. Stout (left) and L. Whitfield, supervisors of the San Tome Camp of the Mene Grande Oil Co. They use "Cat" equipment on moving day because they don't think anything else will do the job.*

LIKE MEN, oil rigs can't go to work until they get to the job. That's why it's important to get rigs back on the time sheet as soon as possible when moving to a new location. And it's why the Mene Grande Oil Company, C. A., of Anzoátegui, Venezuela, relies on "Caterpillar" equipment to pull this workover rig to a new location near the village of El Tigre.

"Without 'Cat' D8 Tractors, this job of moving rigs would be impossible," says J. R. Stout, supervisor of rig-moving operations.

The 129-ft. derrick is pulled by two D8 Tractors—at 2 kilometers an hour (1.25 m.p.h.). To make sure this outfit will soon be making hole again, a "Cat" No. 12 Motor Grader prepares the road ahead.

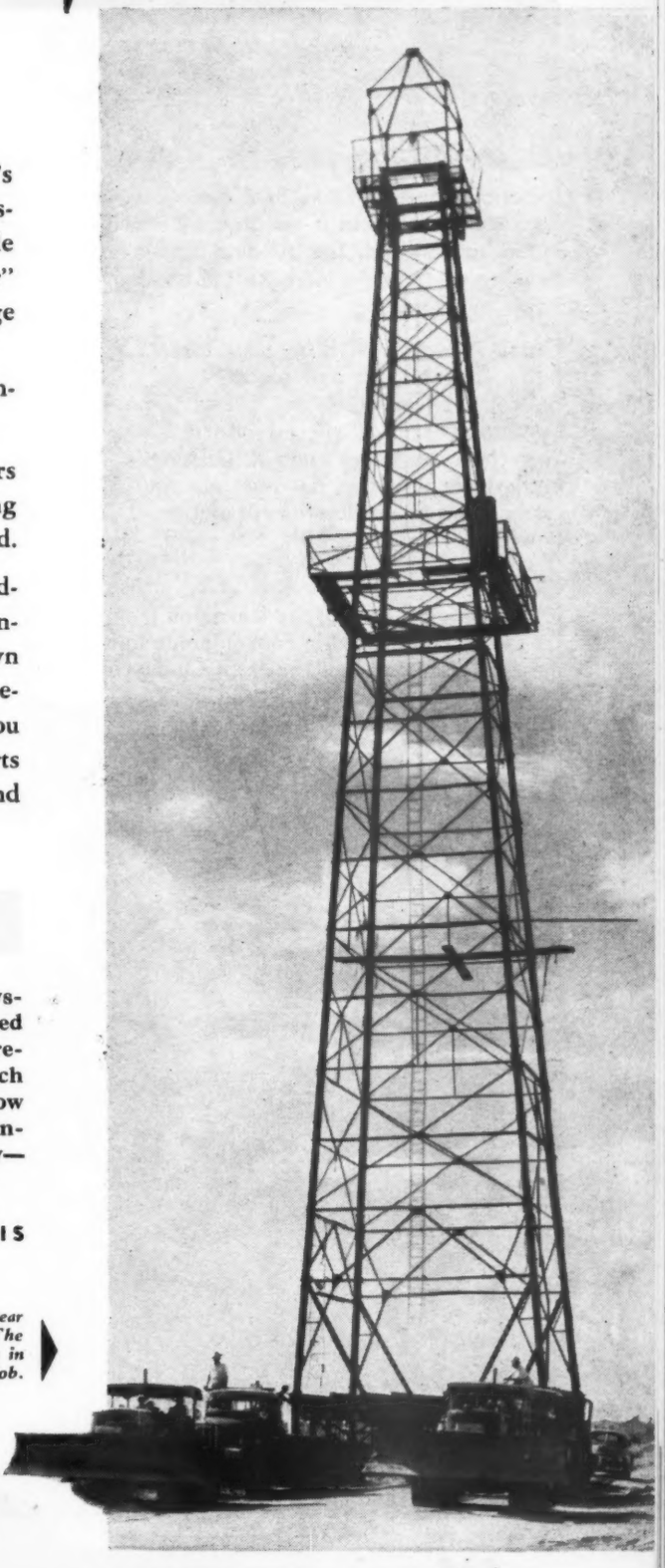
The Mene Grande Oil Company has found that it pays to standardize with "Caterpillar" equipment. "Cat" machines are precision-built to work together, and to keep going on the job without down time. When you're operating afield and the going is rugged, it's especially important to invest in the best. And with "Cat" equipment, you buy-in on world-wide "Caterpillar" dealer service—adequate parts stocks and factory-trained servicemen to keep wheels, tracks and engines turning on location.



## LOOK UNDER THE HIDE

**Filters are the watchmen of an engine's lubricating oil system. That's why "Caterpillar" filter elements are engineered and manufactured to extremely strict standards. They remove harmful particles as small as 39-millionths of an inch . . . remove sludge . . . have large filtering area and high flow rate . . . do not remove beneficial additives . . . are vibration-proof and waterproof. Look under the hide for quality—you'll find it in every "Caterpillar" detail.**

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

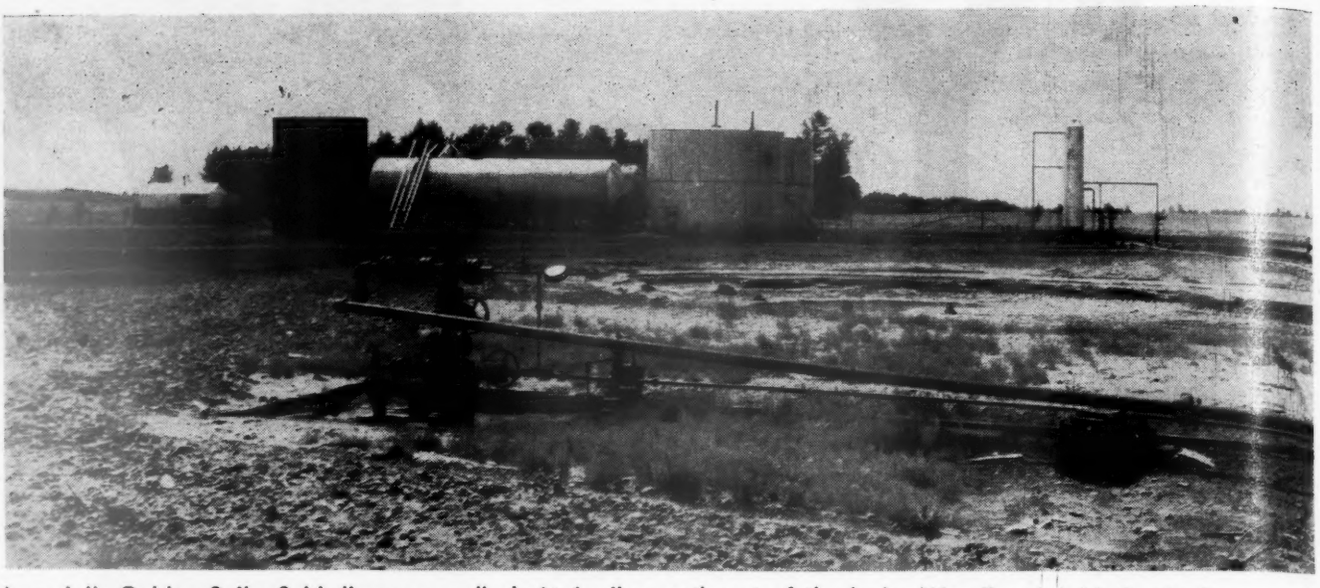


*"Cat" D8 Tractors equipped with Hyster winch "walk" this rig to work near El Tigre, Venezuela. The rig is powered by two D13000 "Cat" Diesels. The "Cat" D8 Tractors once moved a drilling rig 70 kilometers (43.5 miles) in 20 hours. The 15-man crew works 8 hours a day on this chauffeuring job.*

**CATERPILLAR**

REG. U. S. PAT. OFF.

**DIESEL ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT**



Imperial's Golden Spike field discovery well about 6 miles northwest of the Leduc-Woodbend field. Production from the 4-well field is handled by a two-stage separator installation and the storage tanks in the background. The building (upper left) houses the pipe line pump station equipment. Further development should increase the number of producing wells in this prolific D-3 zone field.

Leduc is that the drilling mud circulation may be lost and the well will blowout. This danger has caused the operators to exert special efforts to keep the wells under control. Drilling mud control alone is not always enough to prevent loss of circulation, however, combined with the casing program now used, the danger of another serious blowout is greatly reduced.

The 10¾-in. surface casing is set below the glacial drift, usually about 300 ft deep. A 9-in. hole is then drilled to the base of the green shale, which is just above the D-3 pay. A string of 7-in. casing is then set and cemented in the hole. The producing zone is then drilled through the 7-in., and a 5-in. liner is set and cemented up into the 7-in.

The drilling mud is conditioned for drilling the pay with 50 to 100 sacks of sawdust or lost circulation material. Sometimes it is necessary, however, to pump 25-sack plugs of cement into the hole and wait for them to set before continuing through the very porous (almost cavernous) gas cap section of the pay zone. As many as 83 cement plugs have been used in a single well.

A diamond core of the Devonian D-2 producing zone is being removed from the core barrel in convenient lengths by a member of the drilling crew on the Marjack No. 1 well, north of Calmar in the southwest part of the Leduc field.

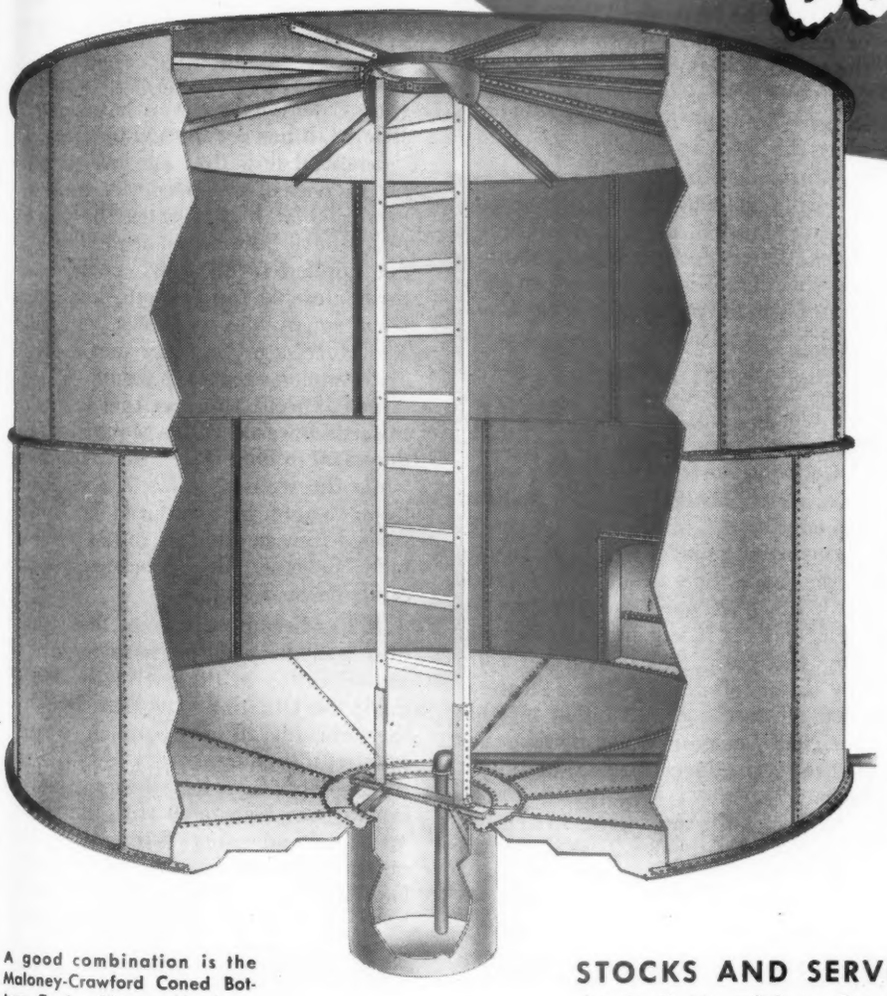
### Cost of Wells

The cost of drilling and completing D-3 wells in Leduc is about $45,000, including some diamond coring through the pay zone and acidizing with from 25 to 100 gal in the D-3 zone. Usually D-2 wells are acidized with 500 and 2000 gal in two stages.

Most of the D-2 and D-3 wells in Leduc are flowing. A few are making water, however, and are on the pump. Flowlines are generally buried about 4½ ft deep to prevent freezing in the winter time. The wells are controlled by valves at the tank battery manifolds. They are flowed faster about every two weeks to clean paraffin out of the flowlines.

Most tank batteries are equipped with low pressure steam boilers for keeping the leases operating during the cold weather. Steam coils are installed in tanks and separators, in the operator's doghouse, and even in the gas meter boxes (to keep the mercury from freezing when the temperature falls below — 37 F). * * *

# HOW A MALONEY-CRAWFORD CONED BOTTOM WILL HELP COMBAT Tank Corrosion



A good combination is the Maloney-Crawford Coned Bottom Tank with an Aluminum Deck, for such a deck materially reduces the corrosion effects of hydrogen sulphide gas in solution with crude oil.

Maloney-Crawford originated the CONED BOTTOM TANK with sump tank as an aid in combatting corrosion caused by water and galvanic action in the bottom and lower ring of a bolted tank.

The tank bottom has a drop of 1" to 12" horizontal run, permitting the complete drawoff periodically of all water and BS from the tank bottom thru a drain connection as shown in the illustration to the left.

The sump tank is 35¼" in diameter fabricated from 3/16" steel. Depths of 12" and 3'-0" are available. The inside ladder is supported by a heavy channel member laid across the top of the sump tank.

The sump tank is removable without taking up the bottom or dismantling the tank. The bottom, apron and sump tank joints all overlap towards the sump tank to prevent pockets for water collection and subsequent local corrosion.

Write for further information or see a M-C representative at any of the stocks and service points listed below.

## STOCKS AND SERVICE AT THESE OIL CENTERS

Artesia, N. Mex.; Calgary, Canada; Corpus Christi, Texas; Casper, Wyo.; Dallas, Texas; Edmonton, Canada; Farmington, N. Mex.; Fort Worth, Texas; Houston, Texas; Lafayette, La.; Lloydminster, Canada; Newcastle, Wyo.; New Orleans, La.; Odessa, Texas; Oklahoma City, Okla.; Pampa, Texas; Redwater, Canada; San Angelo, Texas; Snyder, Texas; Tulsa, Okla.; Wichita Falls, Texas.

# MALONEY CRAWFORD

MALONEY-CRAWFORD TANK & MFG. CO.

**FACTORY AND GENERAL OFFICE:** 38 NORTH PEORIA — BOX 659 — TULSA, OKLAHOMA
**EXPORT REPRESENTATIVE:** Baird Lines, 420 Lexington Avenue, New York, N. Y.
**CANADIAN REPRESENTATIVE:** Maloney-Crawford of Canada, Ltd., Edmonton, Canada
**ROCKY MOUNTAIN REPRESENTATIVE:** W. H. Connor, Inc., Casper, Wyo.
**TEXAS PANHANDLE REPRESENTATIVE:** Atlas Tank Company, Pampa, Texas

# Gas Lifting Oil in the Turner Valley Field*

S. F. SHAW

THE oil zone of the Turner Valley field, Canada, was discovered in June 1936 in the Madison Limestone at depth of 6828 ft. and since that time about 300 productive oil wells have been drilled, covering an area of about 15,000 acres. At the end of 1949 there were about 280 producing wells in the field, the deepest of which reached a depth of 10,237 ft. Spacing has been on 40-acre basis, with the exception of a few wells drilled on 20-acre spacing. Porosity is not uniform, and has been variously estimated at 7 to 12 per cent, with a combined thickness in the two productive zones of about 165 to 180 ft. So far as the author knows, no actual determinations of porosity have been made in this field. The gravity of the oil at the time of discovery was 52 API in the shallower wells adjoining the gas cap, and about 41 API in wells lowest on the flank of the structure. The usual casing employed was 7-in. OD, with a few strings of 6⅝-in. OD. As a general practice, tubing has been 3-in. ID, although a few tubing strings of 2½-in. and 2-in. ID have been employed.

In the early life of the wells, the gas that was produced with the oil provided several times as much energy as was necessary to propel or carry the oil through the formation to the well and then to lift it to the surface. During this period there was not sufficient demand to permit extraction from wells at maximum capacity, especially during the winter months, and it was then necessary to restrict severely the withdrawal rate. During the summer months the wells were produced at considerably higher rates, and it was observed during the summer months that the gas-oil ratios increased markedly and then decreased quite considerably when production was restricted during the winter months. There has been, however, a gradual increase in the yearly average gas-oil ratio even though the production has been restricted, and it raises the question whether the oil which was of necessity not produced during the winter months would have been produced with a cumulative average gas-oil ratio as low or lower than it has been over the past fourteen years. Gas-oil ratios in yearly periods for the limestone reservoir oil production are given in Table I.

It must be recognized that when oil or gas is produced from a reservoir, the pressure in the reservoir is reduced gradually unless some other fluid is injected into the reservoir to take the place of the withdrawals. If the oil is saturated with gas, some of the gas dissolved in the remaining oil comes out of solution as the pressure declines. A portion of this gas accompanies the oil that is produced, and some migrates to the upper part of the structure, where it forms a gas-cap condition. This action results in gas-oil ratios that increase gradually throughout the reservoir, such as has been the case at Turner Valley, particularly in wells in the upper part of the structure, which are affected by the gas-cap condition.

During the first three or four years of the field's operation, gas-oil ratios of 3000 cu ft/bbl were regarded as high, and yet it will be observed that after the year 1943 the gas-oil ratio has been climbing steadily above 3000 cu ft/bbl even though oil that was held back under restriction has had to be produced during these later years.

Early gas-lift tests were carried out in wells down the flank, at depths of 8222 ft and 8639 ft respectively, and showed that gas lift could be effective in lifting the oil when natural flow ceased to function satisfactorily. Gas-lift operations were not put into use at that time, however, since the wells were able to produce their allowable without recourse to artificial methods. Since 1941 the bottom-hole flowing pressures have declined steadily, and this, together with encroachment of small quantities of water, made it necessary to employ gas lift beginning with the year 1945. Since 1945 there has been a gradual move towards the installation of gas lift, particularly in the deeper wells, inasmuch as other lifting methods have not proved economically profitable or practicable. Some of the wells at shallower depths also have been put on gas lift, and the outlook for gas-lift application on other shallow wells appears promising.

The advance of edgewater has been slow, as would be expected in a formation with the low porosity and permeability found in this field, and as edgewater advances toward the wells, it is noted that gas-oil ratios gradually decrease because the water advancing does not carry in solution any appreciable quantity of gas. Encroachment of water, which has to be lifted with the oil, coupled with the condition that the oil in these wells has to be lifted through a much greater distance than in wells up the dip, has brought about a gradually increasing need for artificial lifting methods in order to produce this oil.

Of late years, whenever for any reason extraction in a well has been restricted, it has become evident in wells on natural flow that the gas-oil ratio has increased, and whenever wells are produced at higher rates the gas-oil ratios have become reduced. This has not applied to all wells, particularly those close to the gas cap, but it has been so in the majority of wells. Therefore, it might seem that a greater ultimate recovery would be obtained if wells showing this tendency towards lowered ratios would be produced at higher rates of extraction, while the wells showing the opposite trend would be produced at lower rates. From an administrative point of view, however, this procedure could easily cause difficulties.

It has become apparent that whatever was the position with regard to gas-oil ratios in the early life of the field, the situation now deserves further consideration inasmuch as the greatest ultimate recovery of future reserves depends primarily upon utilizing the gas associated with the oil to maximum advantage for moving the oil through the formation to the wells. Once the oil is delivered to the well bore, it can be lifted by artificial means.

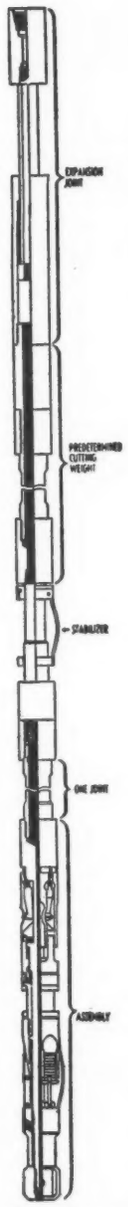
When natural flow conditions prevail in a well, the function of the gas associated with the oil in the reservoir consists of two operations which are wholly distinct. These two operations are: (1) moving the oil to the well, and (2) lifting the oil to the surface. There comes a time in many fields when the quantity of gas required to lift the oil to the surface is greater than that required to move the oil through the reservoir to the well, due to the increased quantity of gas required to lift the oil through the greatly increased distance through which the oil must be lifted, and to the reduced pressure existing at the bottom of the well. When this time is reached,

*From J. Inst. Petrol. Techn., June, 1950, 318, 382-386.

## POINTS TO LOOK FOR WHEN CHOOSING FISHING TOOLS

NUMBER 4 OF A SERIES

# Predetermined Weight on Cutting Tool Essential to Positive Pipe Cuts

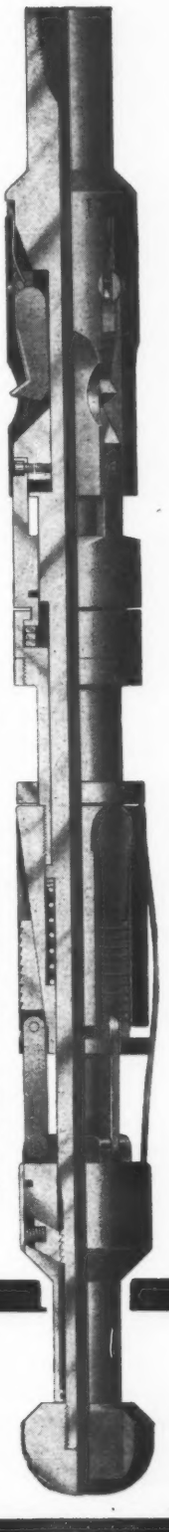



In designing an Internal Pipe Cutter for casing, drill pipe and tubing, Bowen not only included outstanding features in the tool itself which insure safe, positive cutting, *but went a step further and worked out Accessory Equipment which gives you the ideal downward cutting weight on the knives for positive cuts in any size, grade or weight of drill pipe or tubing!*

That's a mighty important point, because a cutting job doesn't come along every day. But when it does, you want to know that the downward weight on the cutting tool is exactly right to give you clean, accurate cuts without tool chattering or crawling. And with the Bowen Internal Cutter plus this simple accessory equipment, you're insured against failure under all kinds of cutting conditions!

### EASY TO RUN

For cutting casing, the Bowen Cutter alone is run in and operated in the conventional manner. But for cutting the smaller diameters, such as drill pipe and tubing, accessory equipment is recommended because it practically eliminates chance of errors. The equipment consists simply of a Stabilizer, assembled one single above the Cutter, the Predetermined Cutting Weight, and Expansion Joint. The Predetermined Cutting Weight is simply the number of pipe joints required for proper downward pressure on the knives—and this information is furnished by Bowen for each individual job. The Expansion Joint assembles above the Predetermined Cutting Weight and, when the run-in string is lowered about 10" and rotation started, allows the Predetermined Cutting Weight to rest upon the Cutter and feed the knives with the proper downward pressure. The run-in string above the Expansion Joint is held in suspension and does not bear upon the cutting tool. Rotation is continued until free action indicates that the cut is complete. Then, simply elevating the cutting string restores the Cutter to its run-in position and it may be either raised or lowered for additional cuts *without coming out of the hole!*



**The Bowen Internal Cutter is ideal for use with the Bowen Spear and Jar for all types of cut-and-pull operations. It is carefully built of the finest materials and is available in a full range of sizes for cutting casing, drill pipe and tubing. Write for the Bowen catalog.**

**SR BOWEN CO**

MAIN OFFICE AND PLANT:
11008 SOUTH NORWALK BOULEVARD
SANTA FE SPRINGS, CALIFORNIA
EXPORT OFFICE:
30 ROCKEFELLER PLAZA
NEW YORK CITY, NEW YORK
EXPORT REPRESENTATIVE: VAL. R. WITRICH, JR.

the minimum quantity of gas that will accompany a barrel of oil to the well should be supplemented by gas lift, so as to make it unnecessary for the oil to be accompanied from the reservoir by more gas than what is necessary to move the oil to the well bore. This excess gas is lost energy in the reservoir, and results in reducing the ultimate recovery.

Flowing pressures at the bottom of the wells are now down to values varying from 500 psi to as low as 80 psi, which means that if wells are restricted to such an extent that it is necessary to impose a back pressure of 50 per cent of the flowing pressure in order to carry out this restriction, considerably more than 50 per cent of the lifting energy in the gas is wasted at the well-head. For instance, if the flowing pressure at the bottom of the well is 100 psi the foot-pounds of work inherent in a cubic foot of this gas at sea-level is about 4400, and if a back pressure be imposed at the well-head amounting to 50 psi the energy so wasted is about 3100 ft-lb or about 70 per cent of the total expansive energy stored in the gas at the bottom of the well. It is therefore evident that it requires much more gas to lift a barrel of oil under such a condition of back pressure than if there be no back pressure imposed.[1]

The porosity in the producing formation of the Turner Valley field is so low that it is doubtful whether any form of secondary recovery method will be effective in this field. Therefore, it is important that the operator should extract as much oil as possible for every cubic foot of gas that is associated with the oil in the reservoir. The Royalite Oil Company deserves credit for experimenting with water injection in a well down the flank of the structure at the rate of about 1500 bbl per day, to determine whether water flooding can be utilized. It is understood that during the past year of operation some benefit has been observed in one or two nearby wells, and further effort may determine whether this project is commercially feasible.

Gas-lift operations are now being carried out by the various companies, some of which use or have under consideration the use of plunger-lift installations. Casing-head pressure has been reduced to 65 psi or about 80 psi at the bottom of the well in one plunger-lift operation while producing about 40 bbl of oil per day from a well 8639 ft in depth through 2½-in. tubing. However, freezing troubles as well as some other troubles have been encountered when using the plunger lift to a greater extent than when employing continuous gas-lift operations. However, bottom-hole pressure can never be reduced to as low a point on continuous gas lift as by means of the plunger lift.

[1]S. F. Shaw. *J. Inst. Petrol. Techn.*, 1932, 18, 692-700.

**TABLE 1.**

| Year | Barrels of oil produced | | Million cu ft of gas | Gas–oil ratios | |
|---|---|---|---|---|---|
| | Year | Cumulative | | Year | Cumulative |
| 1936 | 671,948 | 671,948 | 4,151 | 6,200 | 6,200 |
| 1937 | 2,098,970 | 2,770,918 | 16,546 | 5,900 | 6,000 |
| 1938 | 6,150,512 | 8,921,430 | 41,778 | 4,100 | 4,700 |
| 1939 | 7,251,063 | 16,172,493 | 65,326 | 3,300 | 4,000 |
| 1940 | 8,173,016 | 24,345,509 | 95,217 | 3,700 | 3,900 |
| 1941 | 9,531,207 | 33,876,716 | 116,839 | 2,300 | 3,400 |
| 1942 | 9,695,913 | 43,572,629 | 147,298 | 3,100 | 3,400 |
| 1943 | 8,986,663 | 52,559,292 | 175,148 | 3,100 | 3,300 |
| 1944 | 7,874,917 | 60,434,211 | 205,096 | 3,800 | 3,400 |
| 1945 | 7,005,589 | 67,439,800 | 236,544 | 4,500 | 3,500 |
| 1946 | 5,928,444 | 73,368,244 | 268,077 | 5,300 | 3,800 |
| 1947 | 5,917,292 | 78,385,538 | 299,491 | 6,360 | 3,800 |
| 1948 | 4,428,688 | 82,814,224 | 330,243 | 6,900 | 4,000 |

**TABLE 2—Examples of increased production and reduced gas-oil ratios by reducing back pressure in Turner Valley wells.**

| Well | Average production per month during six months preceding reduction of back pressure | | Average production per month during six months following reduction of back pressure | |
|---|---|---|---|---|
| | Bbl/month | Gas–oil ratio | Bbl/month | Gas–oil ratio |
| Brown No. 2 | 726 | 9,300 | 1,105 | 5,050 |
| Three Point | 826 | 6,800 | 1,353 | 4,600 |
| Davies No. 1 | 686 | 12,600 | 841 | 7,500 |
| Davies No. 2 | 266 | 20,000 | 351 | 17,100 |
| Davies No. 2 | ... | ..... | 389 | 16,000* |

* During the next five months, after the first six months.

**TABLE 3.**

| Well | Average bbl/month | | Average gas–oil ratios | |
|---|---|---|---|---|
| | Before applying gas lift | After applying gas lift | Before applying gas lift | After applying gas lift |
| Anglo No. 1 | 1,277 | 1,750 | 2,850 | 2,100 |
| Anglo No. 5 | 838 | 1,130 | 2,100 | 3,560* |
| Anglo No. 7 | 3,651 | 3,470† | 2,700 | 2,530 |
| Extension No. 2 | 1,607 | 2,538 | 1,540‡ | 2,020 |
| Four Star | 2,598 | 3,558 | 1,660 | 1,180 |
| Vulcan-Brown | 2,264 | 2,939 | 2,800 | 1,980 |
| Davies No. 4 | 376 | 638# | 16,000 | 9,200 |

* This well is on plunger lift. The intermittent character of the flow makes the computation of output gas almost impossible to determine.

† Water percentage produced in this well has been 33.3 per cent for the first nine months of 1949. This well with Nos. 1 and 5 Anglo are the lowest wells on the structure in this vicinity.

‡ Extension No. 2 of the Anglo-Canadian Oil Co. was placed on gas lift in September 1945, and appears to have been the first well in the Turner Valley field to have made regular use of gas lift.

# There has been only one month's report as yet on the operation of No. 4 Davies on gas lift, during which time no gas was returned to the upper porous zone, and was, therefore, a straight gas-lift operation.

It has been demonstrated even on natural flow with little back pressure that gas-oil ratios have been reduced. Some examples are given in Table 2.

Some results of applying gas lift to wells in the Turner Valley field are given in Table 3.

Four Star No. 1 of the Brown-Moyer-Brown Company was one of the early wells placed on gas lift in the Turner Valley field. In this well a packer was set between the two productive zones and a perforation was made in the tubing above the packer so as to admit sufficient gas from the casing into the tubing to lift the oil from the lower zone at maximum rate, depending upon the quantity of formation gas that the well was allowed to produce. Gas is injected into the casing for lifting the oil and also for injecting as much gas into the upper zone as this zone would take under the pressure which is practicable. Any gas that is returned to the upper zone is deducted from the amount of output gas produced from the well, and the remaining gas is balanced against the quantity assigned by the Alberta Conservation Board as the allowable quantity that can be produced.

The first month's production from the Four Star well after completion was 5301 bbl, and the highest production ever reached in this well was 13,229 bbl in March 1938, seven months after completion.

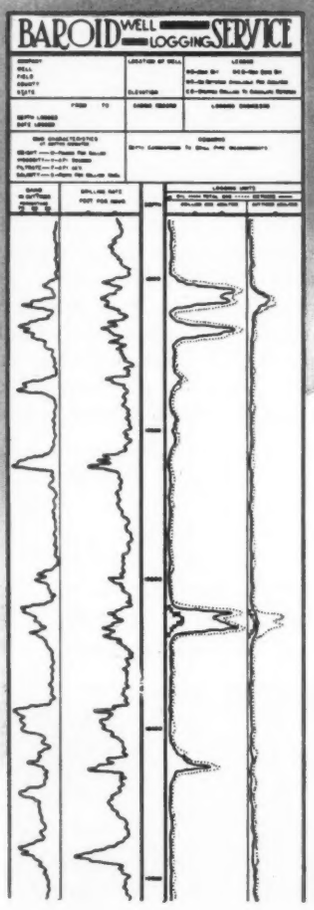
The Four Star well was the sixteenth well to be completed in the oil zone of the Turner Valley field, and at the present time is the seventh or eighth largest producing well in the field. Production of this well in December 1948 was 4473 bbl, and for the first ten months of 1949 the average production was 4079 bbl/month with a formation gas-oil ratio averaging 1500 cu ft/bbl.

Water is slowly moving up the structure into the wells lowest down the flank and in the course of time will have caused all of those wells to cease natural flow. Unless application is made of gas lift or some other method, they will have to be abandoned. It remains to be determined whether encroachment of water will advance higher up the structure than the lowest row of wells down the flank, before the upper wells will have been depleted of oil profitable to produce. * * *

# LOUISIANA OPERATORS RELY ON BAROID WELL LOGGING SERVICE!

## TO CUT WILDCAT DRILLING COSTS

***Mud Analysis and Cutting Analysis Combined in One Log Plus On-Location Core Analysis at No Additional Cost!***




Operators, drilling in the distillate-producing sections of the Cotton Valley and Travis Peak formations, with high temperatures and high chemical content drilling mud, have learned that BAROID Well Logging Service provides the most complete formation information obtainable, as the bit goes down. Accurate indications of oil or gas shows, under these conditions, mean faster drilling. Only zones of positive showing need be cored. No time need be wasted on barren formation. Ask for complete information about this direct logging service for your next wildcat.

YOU CAN RELY ON-

**Baroid**

**BAROID SALES DIVISION**
**NATIONAL LEAD COMPANY**
LOS ANGELES 12 · TULSA 3 · HOUSTON 2

*Call These Numbers*

| | |
|---|---|
| Alexandria, La. | Phone 8630 |
| New Orleans | GAlvez 7397 |
| Corpus Christi | 3-3262 |
| Midland | 596 |
| Casper | 1474W |
| Houston | CEntral 9371 |
| Los Angeles | Michigan 1381 |
| Tulsa | 2-8161 |

P 113.6.004

Part of Peace River survey area seen from the air. The line running north from the bottom center of the picture is a road bulldozed through the bush for winter parties.

EXCLUSIVE

# Exploration Speeded in Peace River by Aeromagnetic Survey

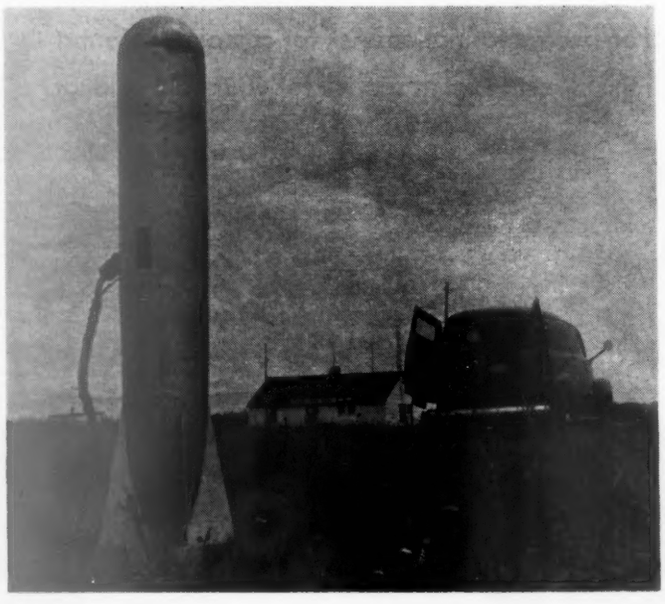
THOMAS O'MALLEY*

THOUSANDS of acres of boggy muskeg. Vast, heavily forested areas. Few roads. That's northwestern Alberta. Probably few tougher testing grounds for exploration activities can be found.

This was the challenge facing Canadian Aero Service Ltd. when it began a 16-million acre airborne magnetometer survey in the Peace River area of Alberta last May. This study proved to be virtually a textbook example of the special usefulness of the airborne instrument. Here is a big area, difficult and expensive to explore on the ground, whose regional geology is not well established. More geologic data was needed quickly, therefore, so as to direct ground parties to areas of prime interest.

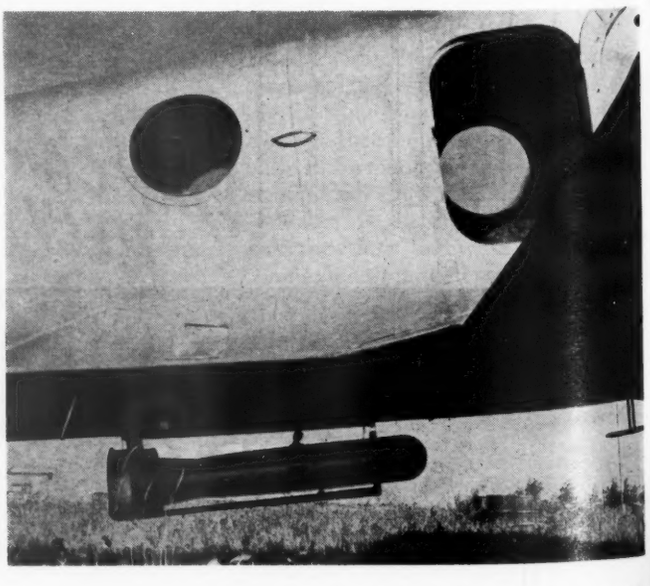
For these reasons four oil companies jointly commissioned and financed aerial reconnaissance of the area. On May 27, then, the magnetometer survey plane took off from Peace River on its first flight. Just 13 weeks later, in late August, the last flight was made. In early September, the first maps from the survey were delivered simultaneously to all participants. All maps from the survey will be compiled and delivered before January 1, 1951, putting a complete aero-

*President, Canadian Aero Service, Ltd.

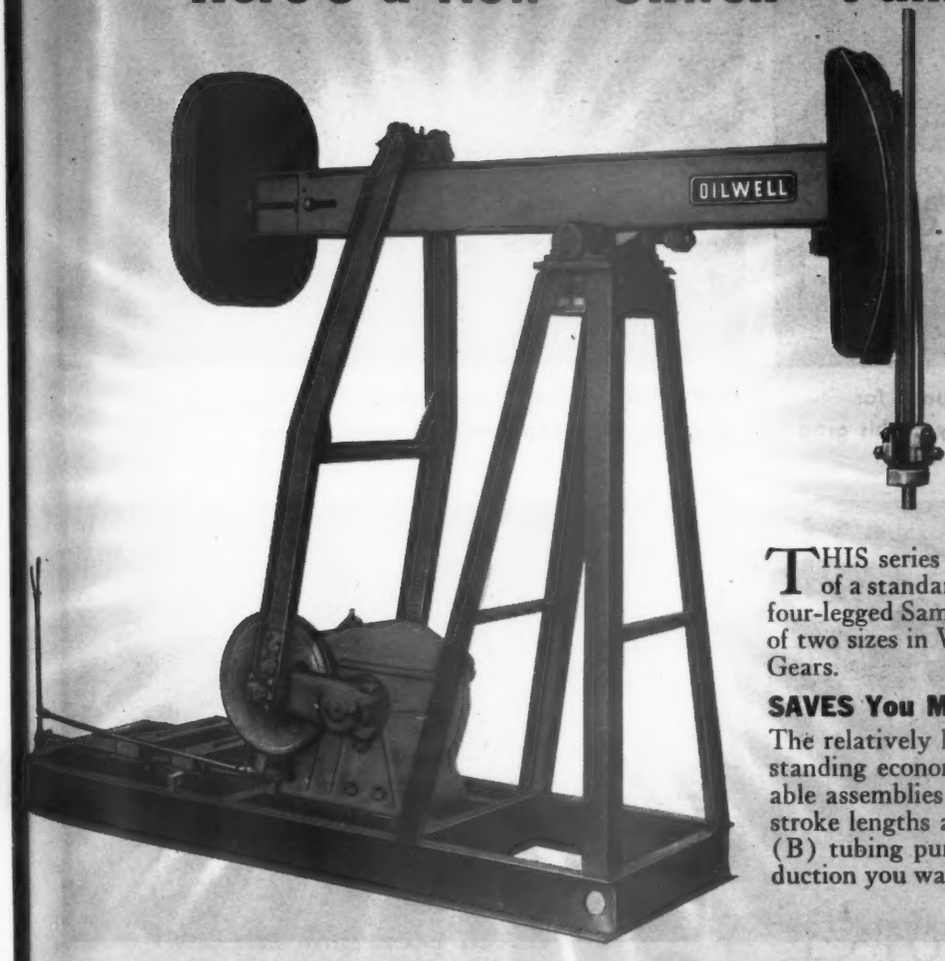


The ground magnetometer operator radioed the results of this monitoring instrument's record to flight personnel before take-off.

The magnetometer, enclosed in a bomb-shaped plastic case, rides in a cradle underneath the ship until the survey begins.



# Here's a New "Oilwell" Pumping Unit




# for SHALLOW WELLS

THIS series of shallow-well Pumping Units consists of a standard structural steel Base with wide-spread, four-legged Samson Post . . . designed for use with either of two sizes in Walking Beams, Pitmans and Reduction Gears.

**SAVES You Money — TWO WAYS!**

The relatively low cost of this series of units is an outstanding economy factor. In addition, its interchangeable assemblies give you the exact combination of (A) stroke lengths and horsepower input needed to go with (B) tubing pump and sucker rod sizes to get the production you want at the lowest possible cost.

***It gives you your choice of:***

## 4 Different pumping-capacity ranges

| | Unit Designation | Reduction Gear Peak Torque Rating | Polished Rod Load Capacity—lbs. | Stroke Length Range—Inches | Stroke Per Minute | Prime Mover Input—H.P. |
|---|---|---|---|---|---|---|
| 1 | 3-A-3 | 16,000 | 3,225 | 22½, 25-3/4, 30 | 20 | 3 |
| 2 | 5-A-3 | 24,100 | 3,225 | 22½, 25-3/4, 30 | 20 | 5 |
| 3 | 3-A-4 | 16,000 | 4,025 | 18, 20-5/8, 24 | 20 | 3 |
| 4 | 5-A-4 | 24,100 | 4,025 | 18, 20-5/8, 24 | 20 | 5 |

### Consult an "Oilwell" Field Engineer on ALL your Production Problems

The more you know about "Oilwell" Production Equipment . . . the better you'll like it. Educational Motion Pictures are available without charge for showings before your production personnel: Ask to see:

*"'Oilwell' Pumps for Oil Wells"*
*"Sucker Rods . . . from Mine to Well"*
*"GEARS . . . and OIL"*

### This New Series of Units

. . . is built with the same field-proven design features that have made larger "Oilwell" Units so popular with producers. Their inherent stability, ample strength and accurate counterbalancing permit safe operations over a wide speed range. Their oustanding features include:

1. Wide-spread four-legged Samson Post.
2. Ample stuffing box clearance.
3. Walking Beam adjustment permitting exact positioning over well.
4. Grease lubricated Saddle Bearings, Upper Pitman Bearings and Wrist Pin Bearings.
5. Spherical Roller Wrist Pin Bearings in Solid Housings.
6. Double Reduction, fully heat-treated, single-helical Gears and Pinions in heavy-duty, adjustable Tapered-Roller Bearings.
7. Band-type Brake with Remote Control.

**OIL WELL SUPPLY COMPANY**

**Branches Serving All Oil Fields**

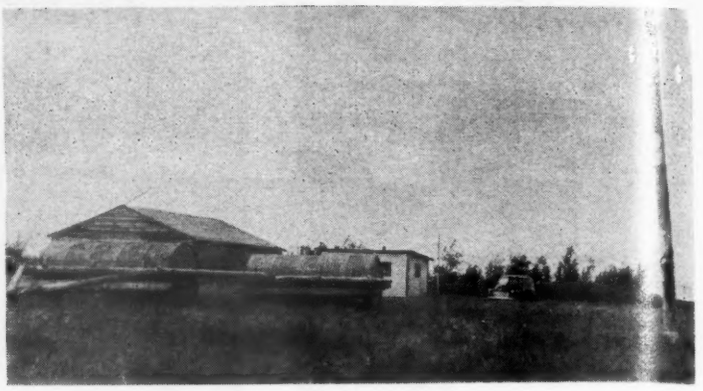
Executive Office — DALLAS, TEXAS
Export Division Office —
30 ROCKEFELLER PLAZA
NEW YORK 20, NEW YORK

Division Offices — CASPER, WYOMING
COLUMBUS, OHIO . . . DALLAS, TEXAS
HOUSTON, TEXAS . . TULSA, OKLAHOMA
LOS ANGELES, CALIFORNIA

USS "OILWELL" TRADE MARK

UNITED STATES STEEL

Main street of Peace River, Alberta, base for much of the ground exploration activity in this area.



Peace River airfield. . . . The huge rollers in the foreground are snow rollers.

The flight survey personnel check over the flight strip before take-off. The pilot follows the flight lines indicated on the strip of aerial photos. The survey plane is seen at the left.

The Sonne continuous strip camera was used to record survey plane's flight path, so that the magnetic record can be correlated with ground positions. Here the data compiler checks the film.

Flight personnel and ground magnetometer operator synchronize their watches according to radio time signals, so that the records of airborne magnetometer and the monitoring unit can be correlated.

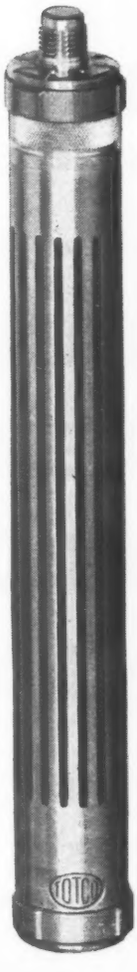
Key to successful execution of the Peace River survey was this ground monitoring station. The Gulf magnetometer, duplicate of the instrument used in the aerial survey, was operated on the ground.

*—another reason*

*for Totco on your rig*

RELIABILITY

1950
1949
1948
1947
1946
1945
1944
1943
1942
1941
1940
1939
1938
1937
1936
1935
1934
1933
1932
1931
1930



With a TOTCO Recorder you have *simplicity* of operation, *sustained* accuracy in recording, and *durability*. Twenty years on rigs back up TOTCO reliability . . . just a few TOTCO-equipped rigs in 1930, a whale of a majority today.

A major oil company wrote, "99% of our TOTCO runs have been *okay to be logged.*" That kind of reliability is possible because TOTCO is the most dependable, precision-built instrument in the oil fields—no expense has been spared in its manufacture.

Whenever and wherever you need a drift indicator, TOTCO field representatives can be relied upon to get you what you need when you want it. You can depend on TOTCO instruments and on TOTCO men—they'll both serve you well.

*Be* **SURE** *you know, use* **TOTCO**

**YOU CAN TAKE TOTCO READINGS ANYTIME**

Run in and out on measuring line.

Dropped down drill pipe; picked up with core barrel overshot.

Dropped down drill pipe; recovered when bit is changed.

Run in the Recorder connected to a core barrel overshot when picking up a retractable core barrel.

Run in and out on ordinary sand line.

TOTCO
*Recorder*

***Technical Oil Tool Corp., Ltd.***
***1057 North La Brea Avenue***
***Los Angeles 38, Calif.***

**Exclusive Distributors:**
*California*—Republic Supply Company of California
*Domestic*—Continental Supply Company
*Canada*—Oil Well Supply Company
*Export*—Lucey Export Corporation, New York

magnetic reconnaissance picture in front of company geologists and geophysicists within seven months from the day flying began. Costs of the survey—about $150,000—will be shared by these companies: Socony Vacuum Exploration Company, Stanolind Oil and Gas Company, Imperial Oil, Ltd., and Canadian Gulf Oil Company.

A like survey on the ground in Alberta would require years to complete. Its costs would be astronomical.

In employing the airborne magnetometer, these companies were using a precise instrument that has already proved itself in half a million miles of surveys in the Bahamas, Cuba, Venezuela, Mozambique, and the United States. The instrument was the Gulf's high-sensitivity airborne magnetometer, which the Gulf Research and Development Company has licensed this company to use for independent contract surveys in the Dominion.

What were the operating problems of this big survey? Notably, they were few. The main fact is that in great part its performance was routine. The survey plane is wholly independent of terrain; it mapped over Alberta's muskeg and forests as easily as it might fly over the plains of Kansas. In a single day's flights, our survey plane covered as much as 800,000 acres. That's a good year's work for ground parties, in spite of the ingenuity and skill they show in working this country.

Shaded area of the map represents more than 16,000,000 acres in Peace River area, Alberta, mapped in a regional airborne magnetometer survey for four large oil companies. Canadian Aero Service, Ltd. performed the survey for Socony Vacuum Exploration Company, Stanolind Oil and Gas Company, Imperial Oil, Ltd., and Canadian Gulf Oil Company.

We found a plentiful supply of aviation gasoline at Peace River, along with a good airfield, hot and cold running water, and electricity. In brief, our staff could set up its base of operations quickly and easily here.

The survey staff totalled nine men—three flyers, an aircraft mechanic, three operators for the airborne magnetometer, and a data compiler, all headed by the project engineer, Jack C. Webster. Spartan Air Services, our affiliate in Ottawa, provided the Avro Anson survey plane and flight personnel; as well as a photo-mapping team based at Grand Prairie, Alberta. This latter unit used a P-38 to obtain the high altitude coverage needed for the north and northeast sections of the survey area, where maps or photography were not available. They delivered the required 1 mile equals 1 inch photo-mapping for the survey.

We staffed for two flights of 5 to 6 hours each daily, weather permitting. Take-off for the first flight was sched-


*For Fast, Efficient, Well-Supervised*

**DRILLING OPERATIONS**

*in Wildcat Territory or Proven Areas*

- operating ten contract drilling rigs—
- equipment designed to meet any conditions—
- experienced personnel and well-maintained machinery—
- two-way F. M. radio and teletype for direct communication from Calgary to field operations within a 40-mile radius of Leduc—
- 380 COMPLETIONS IN WESTERN CANADA—
- OVER 100 COMPLETIONS IN LAST TWELVE MONTHS—

**GENERAL PETROLEUMS OF CANADA LIMITED**

OIL WELL DRILLING CONTRACTORS

HEAD OFFICE . . . . . 509—8th Avenue West

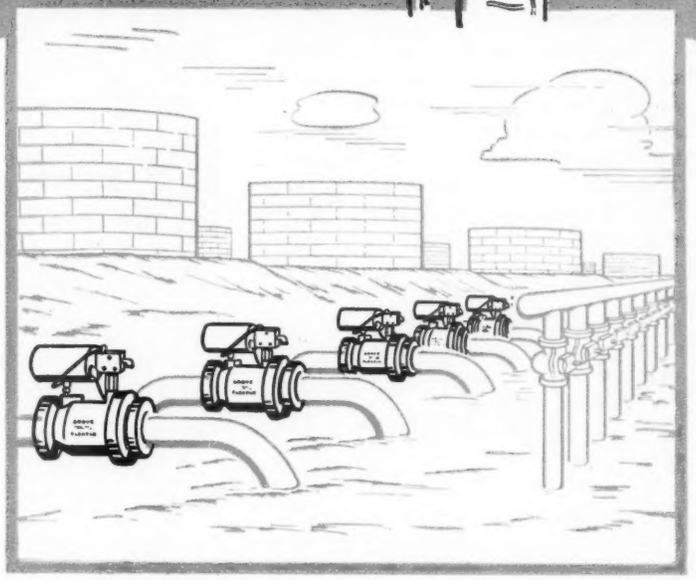
CALGARY Phone 23961 ALBERTA

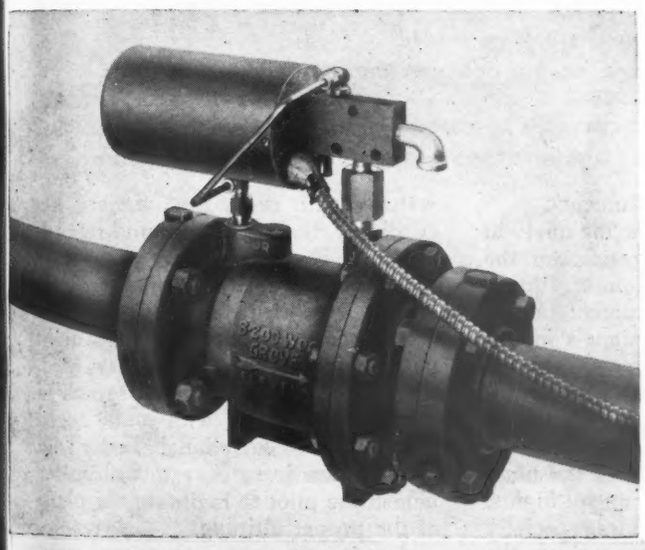
# GROVE REMOTE CONTROL

## SOLENOID OPERATED *flexflo* VALVES

Electrical operation of the Grove FlexFlo is the practical, dependable solution to your remote control requirements. No motors or complicated wiring are necessary. The pressure in the line does the work, opening the FlexFlo with a smooth, rolling action, or closing it with a bubble-tight seal.

The Solenoid Pilot, mounted on the valve, is controlled from a remote panel. This Pilot uses the actual line pressure to open or close the FlexFlo. In this way the Grove FlexFlo Remote Control Valve can be operated as surely and easily as if the operator were at the valve.

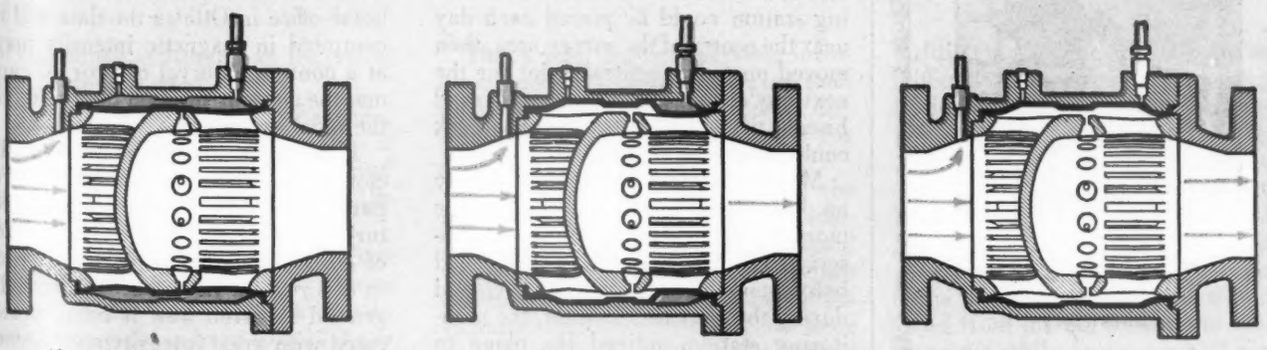




The simple FlexFlo design has been proved in more than ten years of hard service to be unequalled for dependability and long, trouble-free life in the control of air, gas, oil, water, and salt water at temperatures to 150° F. and at pressures to 1500 p.s.i.

Let the Grove FlexFlo engineer show how this dependable remote control valve will increase the efficiency of your plant's operations. Write for full information.

## *flexflo* LETS PRESSURE DO THE WORK



The only moving part in the Grove FlexFlo is a tough Buna N tube, which fits closely around a slotted metal core. When closed, line pressure from within, tending to force the tube off the core, is opposed by equal line pressure on the outside of the tube. Equalizing the inner and outer pressure allows the elasticity of the tube to grip tightly around the core with a positive, sealing action.

As the control pilot closes off line pressure acting on the outside of the tube, inner line pressure, being greater than the outer, begins to roll the tube off the core, opening the FlexFlo.

When pressure on the outer side of the tube is entirely removed, the inner pressure forces the tube completely off the slotted core, opening the valve wide and permitting free flow.

## GROVE REGULATOR COMPANY

1901 CALUMET ST., HOUSTON 4, TEXAS • 6529 HOLLIS ST., OAKLAND, CALIF. • 1930 W. OLYMPIC BLVD., LOS ANGELES, CALIF.

uled for 8 a.m. and the afternoon flight was in the air by 3 p.m. This allowed time to refuel the plane, and perform routine maintenance, and at the same time gave a break in the flight during the part of the afternoon when the air was roughest.

The survey was flown at an altitude of 1000 ft along a series of parallel flight lines spaced at intervals of 1½ miles. In addition, a control pattern tested in other surveys was followed. The entire area was divided into 30 by 50 mile rectangles, then along the periphery of each rectangle an overlapping series of loops were flown. Moreover, for control within the interior areas, a series of tie-lines was flown at six-mile intervals, perpendicular to the original mile-and-a-half flight lines. No magnetic reading, therefore, is more than 3 miles or 1⅓ min from a control point.

Key to the successful and precise performance of the survey, however, was the ground monitoring station. Several magnetic storms occurred in the Peace River area during the survey, and minor disturbances occurred almost daily. At night the storms appear to be accompanied by the Northern Lights; during daylight hours, however, they are not perceptible except with magnetic instruments.

Gas and salt water pour forth from a well abandoned 15 years ago on the banks of the Peace River.

As a constant check during daylight hours we kept in operation on the ground a Gulf magnetometer duplicating the sensitive instrumentation in the survey plane. The plane's instruments alone would not have disclosed a storm which distorted and invalidated the aerial record; the faulty record itself would have been found weeks later during compilation of the magnetic data, through our control flights.

A ton-and-a-half truck was specially equipped with radio transceiver, the magnetometer and associated recording equipment, and a gasoline power unit to supply electric power for the electronic units. This mobile monitoring station could be placed each day near the center of the survey area, then moved on to the central point for the next day's survey. A north-south road bisects the survey area, so the truck could be moved readily.

Monitoring started approximately an hour before take-off time in the morning. If a magnetic storm was observed, the flight could be cancelled before take-off. If a storm developed during the course of a flight, the monitoring station radioed the plane to cease operations and return to its base. Minor magnetic disturbances over a brief span were noted too, so that reflights of small areas could be made when required.

The magnetometer operator in the plane and the operator assigned to the ground unit synchronized their watches with radio time signals. Accordingly, the air and ground records could be checked against each other with full assurance that the time indications were identical.

To record the survey plane's flight path, the Sonne strip camera was used. This photographs the plane's path in a continuous strip; with it the aerial records can be correllated exactly with ground positions. A radio altimeter helped the pilot to maintain the plane at the proper altitude.

A continuous magnetic record accurate to one or two gamma (a gamma is about one part in 50,000 of the earth's field in Alberta) was obtained with the aeromagnetic survey. At our home office in Ottawa the data will be compiled in magnetic intensity maps at a contour interval of 5 or 10 gamma, the contour interval depending on the local gradient.

It is believed these maps will disclose significant geophysical data regarding basement depths and structures, as well as other characteristics of the rocks underlying the sediments in this region. In this area, where the ground research now is being prosecuted with great intensity and ingenuity, the aeromagnetic study has in one great surge collected a body of reconnaissance data which may substantially advance and guide the oil search here. Here, as in the remote reaches of Venezuela and Mozambique, the aerial method proved its unique values as a reconnaissance tool. * * *

Fighting well fire near Big Spring was aided by vacuum tank trucks, which hauled an average of 10,000 bbl of water a day for three weeks from nearby creeks and rivers to cool ground for fire fighters.

# Vacuum Tank Trucks Move Mud

*A recent addition to oil field equipment is a truck that saves drilling mud by taking it from an old location to a new one, cleans tanks, oils roads, and helps fire-fighting.*

CLARIBEL THOMPSON†

It's as simple as sipping an ice cream soda through a straw.

And, if you lingered over that soda, you'd probably take more time than it does to "sup up" 55 bbl of drilling mud and have it on the road headed for the new drilling location.

Nine minutes is about the most time it takes a service company* to fill one of its 55-bbl vacuum tank trucks with mud weighing from 10 to 17 lb per gallon. Lighter fluids can be loaded in as little as five minutes. Small loading pumps might require from 30 min to an hour. Unloading is done in four minutes.

That's why the new service, introduced in Scurry County fields less than a year ago, is saving thousands of dollars in both time and mud costs for drillers in the area.

F. I. Dick Pack, president of the firm,* began with two trucks in October, 1949. He spent discouraging weeks and months trying to convince drilling contractors of the worth of the vacuum service method that has been used in other oil fields in the United States for several years.

It wasn't until about the first of this year that the idea caught on in Scurry activities. Many drillers were abandoning thousands of dollars worth of drilling mud in the pits, because of the difficulty of transporting it to new locations. Now they are having it moved for a nominal fee, and the time element is important. An average hauling job costs about $40 or $50 and takes three or four hours. That also saves rig time, for it takes 12 to 36 hr to mix new mud at a cost of $1000 or more. This service can salvage and move mud from the old location to the new mud pit while crews are still rigging up.

These vacuum tank trucks were called into action when the Pan American Production Company's well near Big Spring blew out and caught fire on June 10 of this year. The well burned for almost a month before it

EXCLUSIVE

*Texas Vacuum Tank Truck Service, Snyder, Texas.

†The Lone Star Gas Company.

Filling at mud pit at completed well can be accomplished in as little as 9 min by use of vacuum tank trucks. Above truck is 55-bbl capacity. Round trip can be made by truck every 45 min if new location is fairly close. Mud is sucked into tank through 3-in. suction hose. Vacuum pump has a capacity of 850 to 950 cu ft of free air per minute.

Delivery is made to new location where mud will be ready for use when rigging up is completed. Truck tank can be unloaded in 4 min. Hose is unnecessary during unloading, which is done by opening valves and reversing the pump. When used for tank cleaning and spraying and oiling roads, duck bill is attached to suction hose.

was brought under control. The vacuum tank trucks hauled water to cool the ground for fire fighters.

Three trucks were in service 24 hr a day for three weeks hauling water from nearby creeks and rivers and spraying it on the ground in the fire area. They hauled about 10,000 bbl of water a day during the emergency.

The trucks are also being used for tank cleaning, which is fast work with the vacuum system, and for road oiling and spraying, and routine water service in an area where water is scarce.

This "fastest method known for handling viscous fluids" will handle liquids of any specific gravity, for the liquids never pass through the pump. Outlet and intake are both 4-in. openings with the discharge valve of 6-in. pipe reduced to 4-in. at the opening. The vacuum pump is a 2½-in. rotary positive blower type with a capacity of 850 to 950 cu ft of free air per min, working at a vacuum of 20 to 22 in. of mercury at sea level. The pump is driven by a power take-off connected to the drive shaft.

Connected to a manifold arrangement by a 2½ in. four-way plug type valve, the pump enables the operator to create a vacuum or pressure on the tank depending on the activity. Sixty feet of 3-in. suction hose is used in loading; however, valves are operated wide open for unloading. The discharge hose is used for spraying and is equipped with a duck bill for tank cleaning and spraying operations.

The firm, of which O. J. McCullough is vice president and secretary, now operates five trucks. One has a 33-bbl capacity. It is used mostly for tank cleaning and water hauling. Four are 55-bbl tank trucks. * * *

### Oil Fire Seen in Czechoslovakia

A fire visible more than 100 miles broke out recently at Kbely, near Malacky in Slovakia, according to a report from Vienna, Austria. It is said the fire was caused by an explosion in a newly drilled well. The fire was visible in Lower Austria, its glow penetrating as far as the Semmering horizon pass, 120 miles away.

The Kbely oil field is the eastern extension of the oil-producing area of Zistersdorf. Exploited by the Germans and taken over by the Russians, its output has not been disclosed.

*In the long run...*

# ALLOY STEELS COST LESS!

● It's true! From crown block to drill bit, in the long run and over the long run, Republic Alloy Steels often cost less than less-expensive carbon steels.

The reason? Extra strength . . . extra toughness . . . more uniform response to heat treatment . . . harder working surfaces . . . higher resistance to fatigue. *All* are qualities which enable alloy steels to withstand the gruelling strains and wear encountered in deep drilling operations, with less danger of costly breakdowns.

Republic offers you a 3-Dimension Metallurgical Service. Veteran field metallurgists—working closely with laboratory and mill metallurgical staffs—are ready to give you prompt, helpful assistance in properly applying these cost-cutting steels to your own specific requirements.

Write, wire or phone *today.*

**REPUBLIC STEEL CORPORATION**
*Alloy Steel Division • Massillon, Ohio*
**GENERAL OFFICES • CLEVELAND 1, OHIO**
Export Department: Chrysler Building, New York 17, N.Y.

*For years, alloy steels have been proving their money-saving ability in drill bits, tool joints, subs, swivels, kellys, blocks, hooks and draw-works parts. They can do the same for you.*

*Republic* REPUBLIC STEEL ALLOY STEELS

**Other Republic Products include Casing—Tubing—Line Pipe—Upson Studs, Bolts, Nuts and Rivets—Electrunite Boiler Tubes**

## Casing Set to Bottom Given Credit for Preventing a Serious Blowout

A RECENT gas fire resulting from collapse of a cement bridge proved the effectiveness of casing set to bottom in a porous formation in the Excelsior field, which is about half way between Edmonton and the Redwater field. The main producing formation in this area is a fragmented coral reef with irregularly porous layers corresponding to the D2 zone in the Leduc field. It is found, when present, about 1800 to 1900 ft subsea. The Viking and Lower Cretaceous gas sands are found very frequently about 1000 to 1200 ft higher. These gas sands were encountered in the Pacific Excelsior No. 2 well about 2700 ft from the surface, and the well was drilled to 3955 ft without finding the D2 producing zone.

A bridge had been set about 2700 ft preparatory to gun-perforating the Viking and Lower Cretaceous sands. Seven-inch casing had previously been landed at 3905 ft or about 50 ft from bottom. When the bridge failed, fire flared up immediately from some cause not determined. The presence of the casing string, however, prevented a serious blowout, although the derrick and drawworks were destroyed completely by the fire.

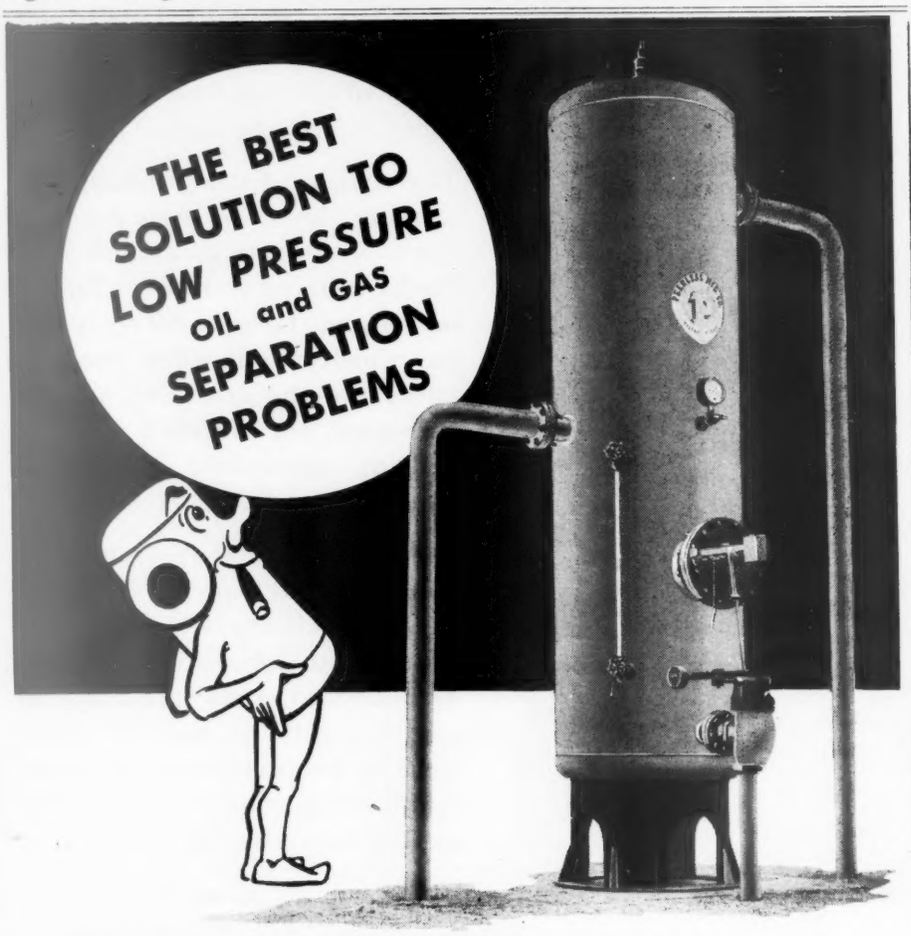
The free gas flow during the fire was estimated from 5 to 20 million cu ft daily. The fire was extinguished by a small dynamite blast set off close to the wellhead, which was accessible due to the fact that the strong gas flow kept the fire almost directly over the hole. About 30 lb of dynamite was used. Six bulldozers were used to make fire guards, and a heavy truck was used to haul buildings off the site.

The well was situated in a gully in scrubby bush country characteristic of ground conditions in the area.

The setting of casing close to bottom has been standard practice before perforating at nearly every well in the northern Alberta fields since the Atlantic No. 3 blowout in Leduc nearly two years ago. Minor blows of gas in the Viking and Lower Cretaceous sands have been encountered before. Farther north, as in the Lac La Biche area, the subsurface formations are fractured badly and pocketed.

It will be recalled that two serious fires occurred during drilling operations last year in that area following gas blowouts.

* * *


**PEERLESS *LOW PRESSURE* Oil and Gas Separators**

. . . are the product of many years experience, extensive field research, thorough application of physical theory, and sound fabrication methods.

The name "PEERLESS" on an Oil and Gas Separator is your guarantee of high quality fabrication and unequalled performance, for Peerless Separators are Guaranteed Separators.

Peerless Separators will reduce the liquid entrainment loss to less than 1/10th gallon per million standard cubic feet of flowing gas — NO OTHER MANUFACTURER MAKES THIS GUARANTEE!

**WRITE FOR BULLETIN 202 or Consult Your Peerless Representative**

PEERLESS MFG. CO. DALLAS TEXAS

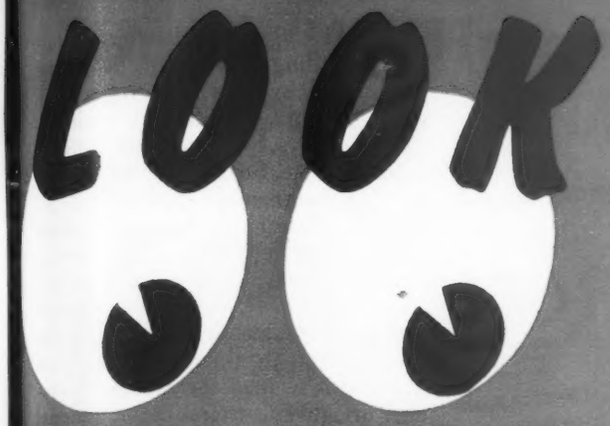
**PEERLESS MANUFACTURING CO.**
Walnut Hill Lane at Old Denton Road
P. O. Box 7193 DALLAS, TEXAS Dixon 4-8431
AGENTS IN: Houston, Odessa, Wichita Falls, and El Paso, Texas. Tulsa, Denver, Phoenix, Los Angeles, Boston, Philadelphia, Cleveland, New York City, Buffalo, Chicago, Richmond.


## Explosives Tests Made In Oil and Gas Wells

As part of its efforts to increase the Nation's recoverable reserves of petroleum, the Bureau of Mines is conducting physical and engineering research aimed at making it possible to determine in advance the type of blasting shot that will be most effective in boosting the rate of production of a given well. Although well-shooting to fracture the surrounding rock formations has been standard practice in the oil and natural gas industry for nearly 60 years, little is known about how such factors as the type of explosive, the shape and strength of the charge, and the method of firing influence the effectiveness of well-shooting in various oil-bearing formations.

A Bureau report just issued describes four series of experimental tests conducted during 1949 by Bureau physicists and engineers. Besides giving a brief history of oil-well shooting, the report describes the tests in detail. Diagrams and photographs supplement the text.

A free copy of Report of Investigations 4714, "Use of Explosives in Oil and Gas Wells—1949 Test Results," may be obtained from the Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pennsylvania.




WHAT YOU CAN DO WITH A

LANE WELLS

TECHNICAL OIL FIELD SERVICES

DRILLABLE

BRIDGING PLUG

*You can use it for...*

UPPER ZONE TESTING AND COMPLETION

ABANDONMENT

FALSE BOTTOM FOR A PACKER

SQUEEZE JOBS

CASING RECOVERY

YOU CAN RUN IT THREE DIFFERENT WAYS

on Lane-Wells conductor cable, or (with special setting tool) on wire line or on tubing.

MULTIPLE-ZONE TESTING

YOU CAN SET IT— AND FORGET IT

Positive, leak proof packoff, as long as you want it. It will outlast the casing on permanent installations.

NITRO TAMPING

YOU CAN DRILL IT OUT IN 4 TO 6 HOURS

with either rotary or cable tools.

QUICK · EASY · ECONOMICAL

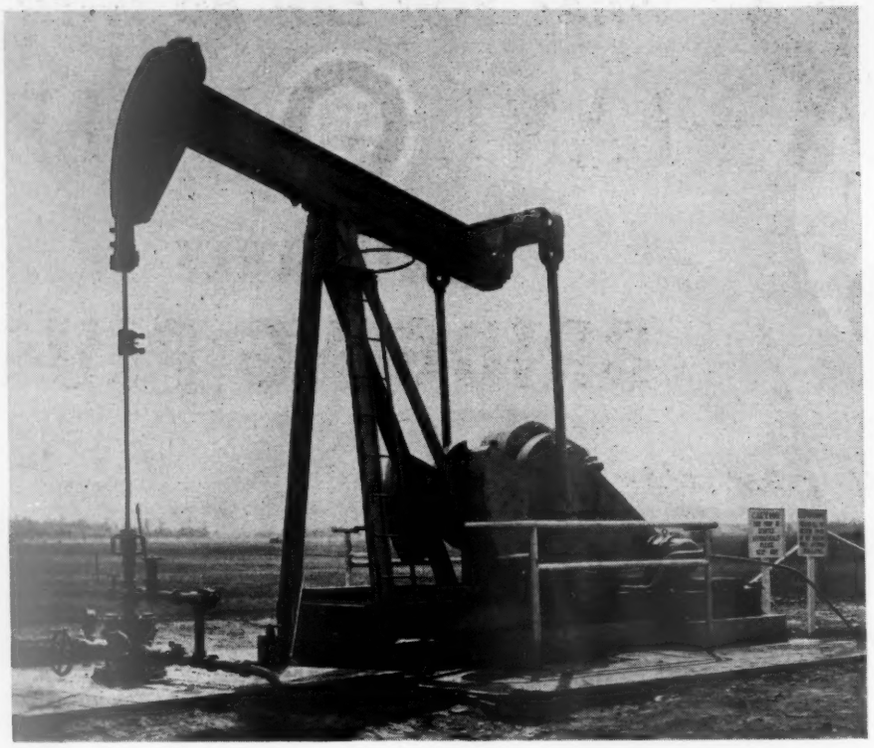
*Ask Your Lane Wells Man!*

LOS ANGELES · HOUSTON · OKLAHOMA CITY

General Offices, Export Office and Plant · 5610 SO. SOTO STREET, LOS ANGELES 58, CALIFORNIA

LANE-WELLS CANADIAN CO. IN CANADA · PETRO-TECH SERVICE CO. IN VENEZUELA

306



Pumping unit in the Redwater field.

*Alberta, Canada*

# The Redwater Oil Field

J. V. DRUMHELLER*

THE Redwater field, celebrating its second birthday this summer, can look back on two years of steady and orderly development. Since the discovery well, Imperial Redwater No. 1, was completed in September, 1948, a total of approximately 600 wells have been placed on production. Completions are continuing at the rate of about 10 wells per week, and at the present time it is estimated that between 950 and 1000 wells will be required to drill out the field under the present 40-acre spacing regulations. Although the field limits have been fairly well defined along the flanks, the ends are being extended gradually. The pool trends in a general northwest, southeast direction for about 17 miles and ranges up to 4 miles in width.

The producing reservoir at Redwater is a limestone reef of upper Devonian age lying at an average depth of 3250 ft below the surface. It is situated about 45 miles northeast of the city of Edmonton, in a gently rolling, wooded, farming country. The area is fairly well settled and the field is now served by a fairly good system of roads. A large part of the surface is covered with scrub brush, muskeg, and sand hills. There is very little surface water with the exception of the North Saskatchewan River, which cuts through the southern section of the field.

### Drilling

Twenty to 25 drilling rigs are operating in the Redwater area. The majority are diesel powered rigs with jackknife derricks and are owned and operated by independent contractors. The prevailing prices average between $4.50 to $5.50 per ft with the contractor providing bits, mud, fuel, and water. The average time from spudding to setting production casing is about 11 days. Seven to 8 rock bits are used per hole. Surface casing, usually 10¾ in. is cemented at 600 ft.

Lost circulation is the main problem encountered in the field, however this is being handled more or less as routine now. The D-2 zone is the chief source of trouble and returns are lost occasionally in the D-3. The usual practice is to load the mud with sawdust or other lost circulation material above the D-2, and maintain it until the hole is completed. A pit of bentonite mud is generally mixed to spud a well, and, from there down, occasional additions of bentonite to the native mud are sufficient to keep it in good shape. A typical mud has an API funnel viscosity of 38 to 42 sec, 12 cc water loss; and weight of 10 lb per gal.

### Completion

General practice is to set production casing, usually 7 in., 23 lb, J-55, in the top of the production zone (D-3) and complete the well in open hole. In a few key wells the zone is cored completely for reservoir information and cased through. Diamond core barrels are used and recovery averages about 98 per cent. Casing is gun perforated and the well given a light acid treatment. Some operators are perforating in a blanket of acid and getting good results. Almost all open hole completions are acidized with 500 to 3000 gal of 15 per cent acid.

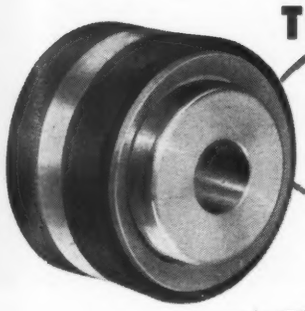
Considerable work has been done by some of the major companies and service companies in their search for

Drilling rig in Redwater.

*Redwell Servicing Company.

EXCLUSIVE

# Here's the First Important Pump Piston Development in Years!



## THE NEW MacCLATCHIE TYPE HD PISTON

***In this new MacClatchie design the piston body STAYS ON THE ROD... replacement time to change piston rubbers is reduced to minutes!***

With this new MacClatchie Type HD Piston there's no need to remove the piston rod from the crosshead end of the pump, disassemble the entire piston and replace with a new one. *The body stays on the rod*—you simply remove and replace piston rubbers, saving hours on pump down time.

*And that's not all!* End plates and center ring, plus the wear-free body and follower, can be used over and over again for additional savings. The *same* body and follower are used for 6" sizes and up, another for smaller sizes—you change only the rubbers as long as liner size remains the same!

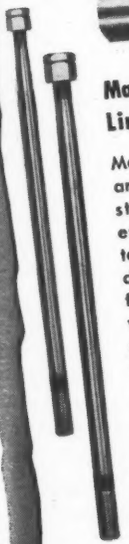
To these money-saving features add piston rubbers of new composition and new construction—with exceptional wearing qualities—the answer to economical piston replacement in your pumps.

***WRITE FOR NEW ILLUSTRATED BROCHURE***

**YOU CAN STANDARDIZE ON MacCLATCHIE FOR ALL YOUR PUMP REPLACEMENT NEEDS**

**A New High-Pressure Valve by MacClatchie**

New design... new performance ...new savings...are engineered into this Type HP Valve. Larger diameter cap insures positive fluid seal. Improved body design provides more striking surface against the seat. Special oil and heat resisting insert provides a perfect fluid seal against top of valve seat and at taper of seat. Available for all sizes and makes of slush pumps. Send for folder.

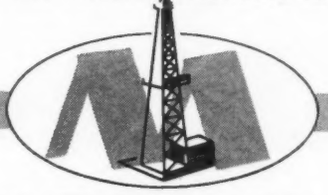


**MacClatchie Slush Pump Liners and Piston Rods**

MacClatchie Pump Liners are made of selected alloy steel, carburized, hardened, and precision honed to a mirror finish. Outside diameters are machined for perfect fit, and provided with centering ring on reduced sizes. Rigidly inspected and tested to insure against washing out. Made in all sizes for all pumps.

Super-hard MacClatchie Piston Rods are made in all tapers for all sizes and makes of slush pumps.

Standardize on MacClatchie!



**MacCLATCHIE MANUFACTURING COMPANY**

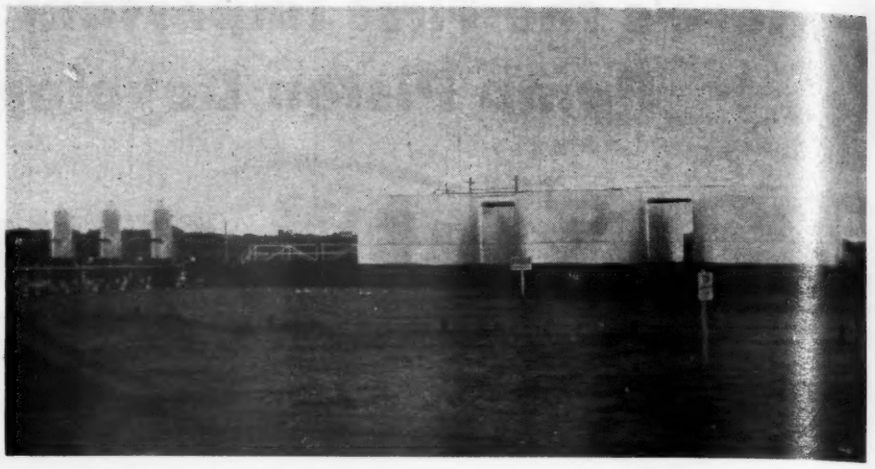
*A subsidiary of Grant Oil Tool Co.*

**MAIN OFFICE & PLANT: COMPTON, CALIFORNIA**

more reservoir information. Core analysis, electric, and radioactivity logs are their chief tools. Fig. 1 is a chart prepared for the purpose of quantitatively evaluating porosity in the Redwater reservoir from neutron and gamma ray logs. Porosity is being evaluated from these logs with an accuracy of plus or minus 0.25 per cent. This is the first practical application of radioactivity logging in evaluating porosity in any Canadian oil field.

### Production

Most of the wells in the Redwater field are going on pump for one reason or another. Some won't flow and others



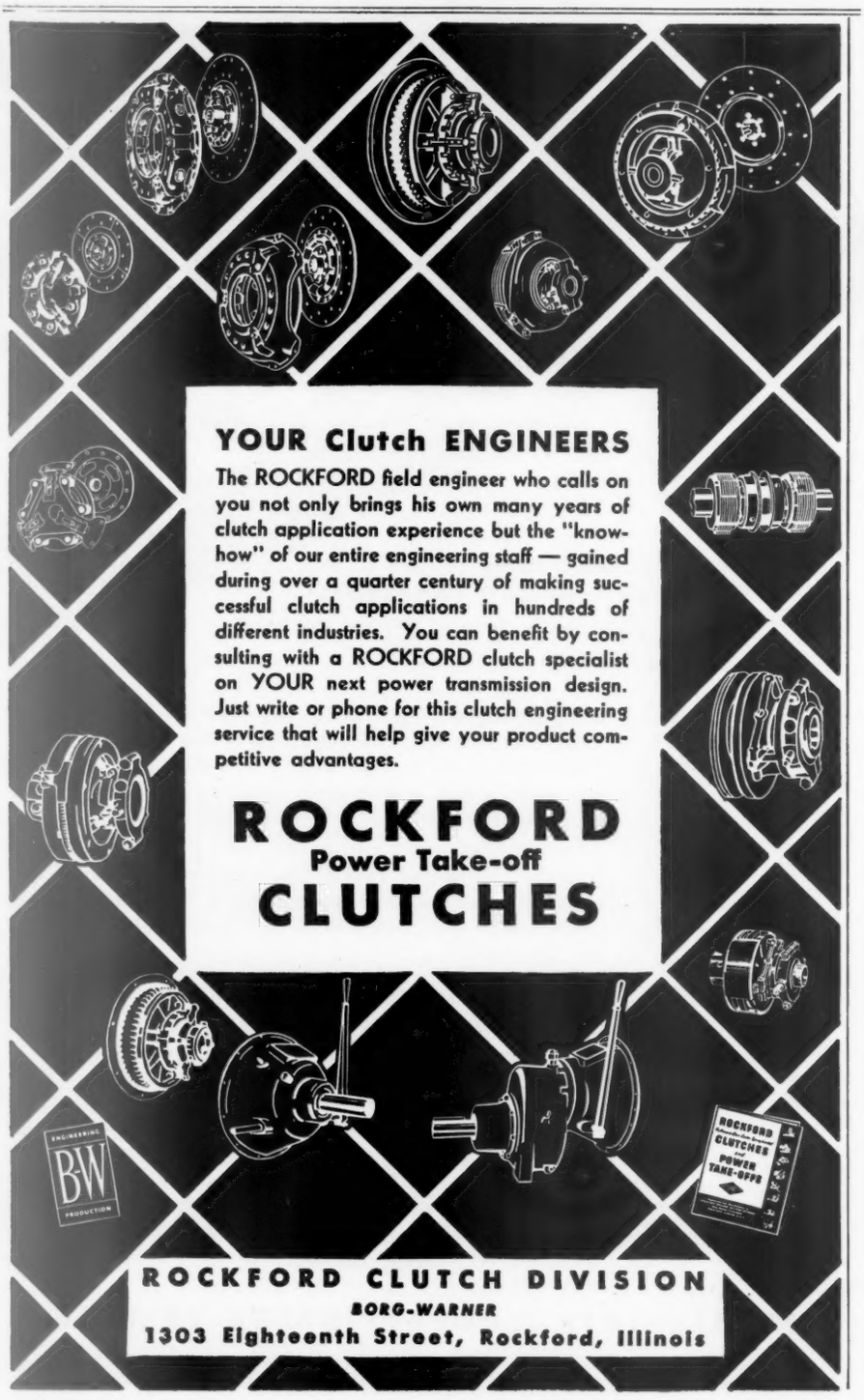
Tank farm, Redwater field.

Ferry crossing on the North Saskatchewan River.

that would flow normally won't kick off without swabbing after being shut in. Due to the present market situation, shut-in periods have been frequent. Pumping units will be 100 per cent electric powered when the present program of field electrification is complete. The majority of pumps are insert type although some operators are installing tubing liner pumps.

Paraffin deposition in tubing strings and flow lines promises to be one of the operators' main production problems. Scrapers are being run on all rods from 500 to 1000 ft from the surface. Pumping or flowing go-devils through lead lines, heating lines with oil fired heaters, and chemical inhibitors are being used with varying success. Dehydrating problems are not very prevalent yet except in a few edge wells and these have not presented any unusual difficulty in treating.

There has not been sufficient evidence yet to evaluate the corrosive effects of the reservoir fluid on well equipment. Some corrosion has been reported, chiefly on wells making water. The water has a salt content of 98,000 ppm. Treater corrosion has



YOUR Clutch ENGINEERS
The ROCKFORD field engineer who calls on you not only brings his own many years of clutch application experience but the "know-how" of our entire engineering staff — gained during over a quarter century of making successful clutch applications in hundreds of different industries. You can benefit by consulting with a ROCKFORD clutch specialist on YOUR next power transmission design. Just write or phone for this clutch engineering service that will help give your product competitive advantages.
ROCKFORD
Power Take-off
CLUTCHES
B-W
ROCKFORD CLUTCH DIVISION
BORG-WARNER
1303 Eighteenth Street, Rockford, Illinois

# For Economical, Dependable Rotation of Your Drilling String

## USE AMERICAN IRON

# Hex or Square

# KELLYS!

### HEX KELLYS

American Iron Hex Kellys are made from *fully heat treated* alloy steel forgings for longer wear and greater resistance to torsional stresses. Driving surfaces are machine finished—and circulation holes precision bored—for smoother running and proper balance at all drilling speeds. Our manufacturing processes and scientific inspection insure straightness, joint alignment, concentricity of bore, hardness and precision threaded connections.

### SQUARE KELLYS

American Iron Square Kellys are also made from a heat treated one piece alloy steel forging with top and bottom integral upset ends formed during the forging operation. The radius on the square of the driving surface is correctly formed during the forging operation. Correct forging processes plus straightness, joint alignment, concentricity of bore, hardness and precision threaded connections, make the American Iron Square Kelly the best balanced square kelly available.

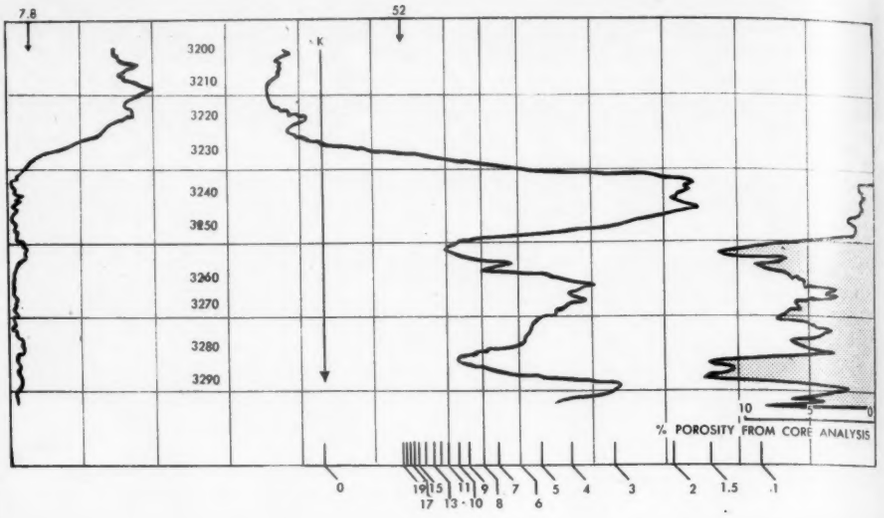
BALANCED FOR SMOOTH RUNNING at all drilling speeds

AMERICAN IRON & MACHINE WORKS CO. · MANUFACTURERS OF OILFIELD EQUIPMENT · A · REG. U.S. PAT. OFF. · OKLAHOMA CITY U.S.A. ·

AMERICAN IRON & MACHINE WORKS CO.
Oklahoma City, Oklahoma · Box 1177 · Phone L. D. 518
District Office: Houston, Texas
Export Office: 11 West 42nd St., New York City, N. Y.

been noticed and is apparently being combatted effectively with the use of zinc anodes. Some operators are installing tanks with galvanized sides and bottoms and aluminum decks.

Cold weather is a problem affecting every phase of the industry. Winter temperatures at Redwater fall as low as —60 F. Drilling rigs, housed in and equipped with a low pressure boiler are able to keep operating, although efficiencies are lowered. Most of the tank batteries are operating without using a boiler except in cases where a treater is required. Lubrication of pump gear boxes is another cold weather problem and is aggravated by the frequent shut-in periods. Steel becomes more brittle and tools must be handled carefully to avoid damage.




Courtesy British American Oil Company

FIG. 1. Application of neutron log in evaluating porosity.

**JENSEN-15 Sizes to choose from**

No matter how deep your well or how great the fluid volume, there's a Jensen built to fit—"just right".

"Just right" means, not only the correct fit but reduced maintenance, less power consumption and more over-all profit for you.

Regardless of the condition of your well let the right Jensen do the lifting for you. See your nearby Jensen dealer or write to us direct in Coffeyville. Do it today.

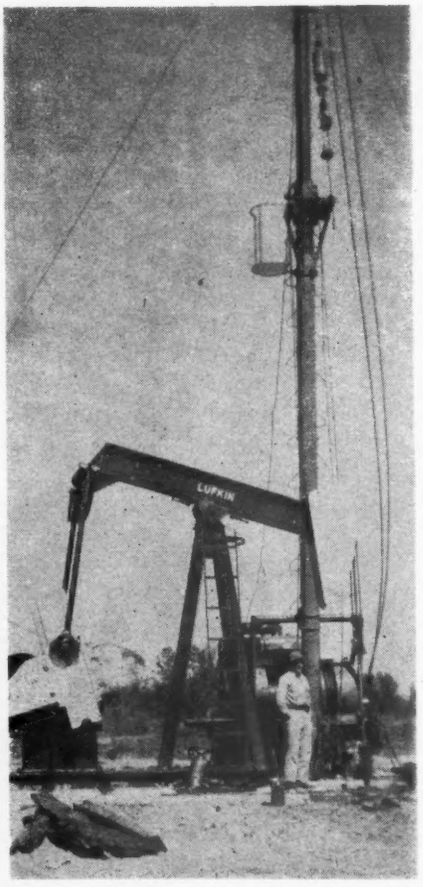
**JENSEN BROTHERS MFG. CO.**

*Coffeyville, Kansas, U. S. A.*

Export Office: 50 CHURCH STREET NEW YORK CITY

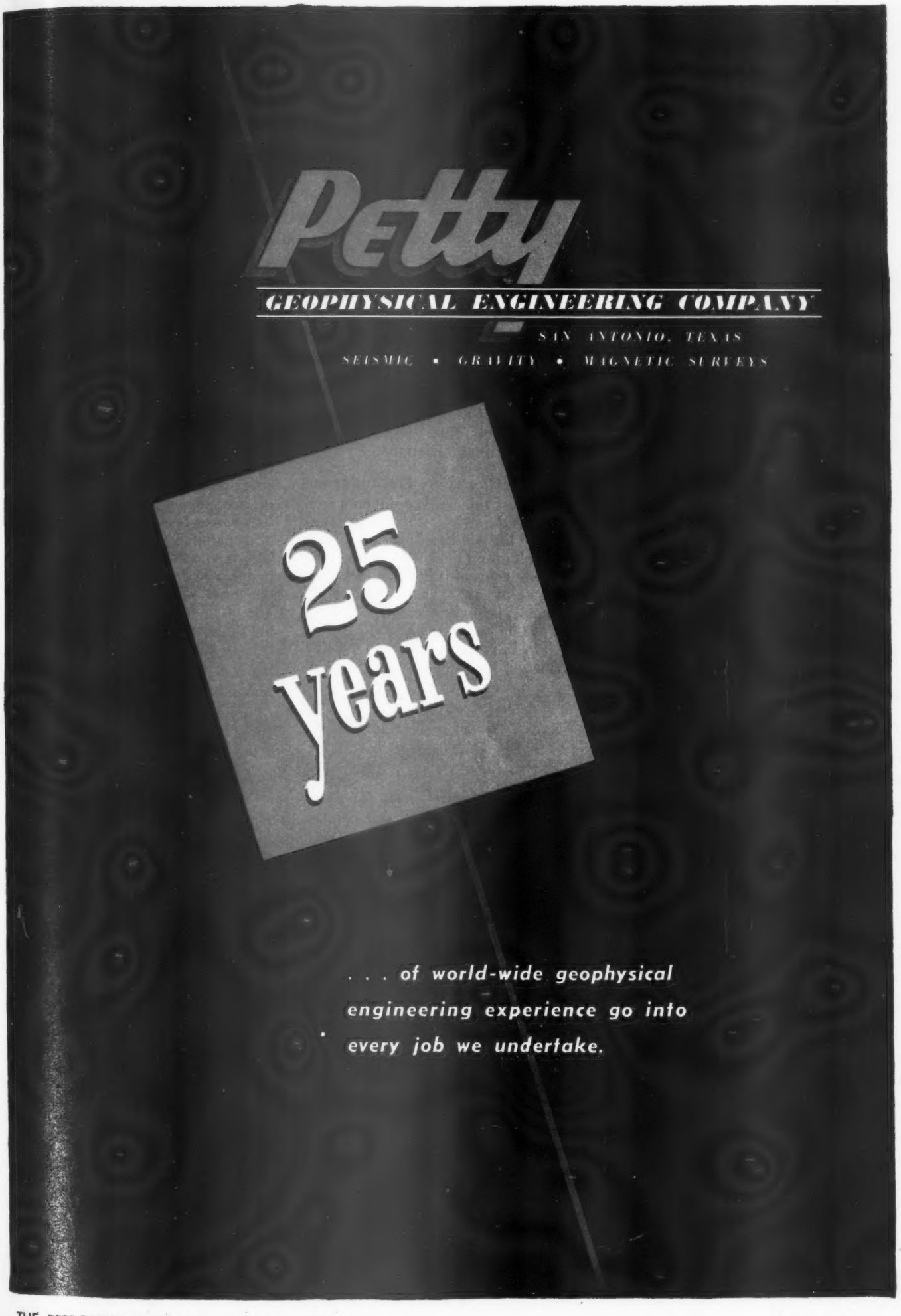

### Reservoir Data

The Provincial Government's Conservation Board has set allowables at 225 bbl per day for all wells in the Redwater field. Present market allowables, however, reduce this figure to an average of 55 to 60 bbl per day. The Redwater Pool Producers' Association comprised of one representative from each operating company in the field, and the Redwater Engineering Committee, a subcommittee of the above, comprised of an engineer from most of the operating companies, work in conjunction with the Conservation Board in setting allowables and selecting key wells for shut-in bottom hole pressure observations. These periodic checks on reservoir pressure—at approximately two-month intervals—have indicated the presence of an effective water drive. The pool has no gas cap and the reservoir fluid is undersaturated. Porosity averages about 8 per cent for the field and the pay thickness, which runs as high as 200 ft averages 88 ft. The original bottom hole pressure was 1050 psi and the gas/oil ratio is 140 cu ft per barrel. The field's cumulative oil production to July 1, 1950 was approximately 8,765,000 bbl. The recoverable reserve of oil in the reservoir is estimated at more than 600,000,000 bbl. Sulfur content is about 0.5 per cent for the crude and 4.5 per cent for the gas. Redwater crude has a paraffin base and gravity is 35 API.




Service rig and pumping unit, Redwater field.

The present posted well-head price for Redwater crude is $2.88 per bbl and indications are that this price will drop when Alberta crude begins competing in more distant markets. The recently completed 16-in. pipe line from Redwater to Edmonton and the soon-to-be-completed line to Winnipeg and Superior, Wisconsin, promise that this time will not be far off. * * *


Petty
GEOPHYSICAL ENGINEERING COMPANY
SAN ANTONIO, TEXAS
SEISMIC • GRAVITY • MAGNETIC SURVEYS
25 years
. . . of world-wide geophysical engineering experience go into every job we undertake.

Bombardier in winter geophysical work.

*Western Canada*

# Winter Problems of Exploration Crews

L. O. ROWLAND

INTRODUCTION into Canada of a new seismic shot-hole drilling rig* promises to solve the problem of muskeg operations in the far north where exploration activity has been pushed this past winter. It is the result of several months of observation of operating conditions in muskeg country such as northern Alberta.

In the past, including the recent winter of 1949-50, most of the muskeg areas (and this includes a great deal of the most active exploration area such as Bear Oil's holdings and the Benedum and Trees group holdings) can only be traversed with safety in the short period from January to about mid-March by conventional seismic vehicles. Ground conditions are such that this is the only hard-frozen period. Principal danger is the risk of getting rigs and vehicles stranded due to break-up in the spring.

The new rig will break down into a number of separate packages that can be hand-carried if necessary over the soft spots. It would also lend itself admirably to helicopter operation. No single package weighs more than 375 lb. Several geophysical firms will be using this equipment during the summer in locations that have never been open for summer seismic work before. What new problems may be encountered will, of course, have to be developed over the next few months and no forecasts can be made yet. Details of the results in operation of the new rig will be available as the summer work goes along.

Detailed specifications of the light rig follow: Total weight 1200 lb; rotary table, aluminum construction, 32 lb; draw works in one piece with cat head, rotary clutch, drawworks clutch, hoist line drum, brake, etc., 130 lb; kelly, swivel, hose and drive bushing, 60 lb; 18 ft mast, tubular construction, 185 lb; 5-hp air cooled engine, 350 lb; base for mounting, 300 lb. Entire assembly can be carried on the back of a half ton pickup truck if desired. Normal winterizing can be applied with minor variations.

*The "Model 100" designed by Mayhew Machine and Supply Company of Dallas and distributed by Seismic Service Supply Company, Ltd., in Calgary, Alberta, Canada.

**EXCLUSIVE**

### Winter Operation Precautions

The most vulnerable point on a seismic rig is the swivel, which is most exposed to the wind and temperature as it is high up on the rig and cannot be reached conveniently by jacketing with steam or exhaust gas passed through. The only general protection that can be used, says Ray H. Wright of G. S. I., is to try to keep the water circulating as constantly as possible.

The entire circulatory system is vulnerable to weather. Steam heat has been used most generally, although exhaust heat from the truck has been satisfactory. Both power and fluid ends of the mud pumps and the water truck pumps have to be jacketed with iron covers to channel the heat. Asbestos cover outside is optional. The hazard of freeze-up is greatest when circulation has to be stopped for pulling out or running in or for minor repairs. GSI is understood to have been first to introduce a storage tank right on the rig as well as on the water truck. The circulatory system is normal, but the rig tank provides a reserve to keep the circulation going while the truck is reloading. This is important in Ca-

In seismograph operations in the Edmonton area dynamite was lowered into a hole drilled into the ground and exploded. Shock waves from the explosion are picked up by geophones spread out at intervals along the ground and recorded on photographic papers in the sound truck shown right.

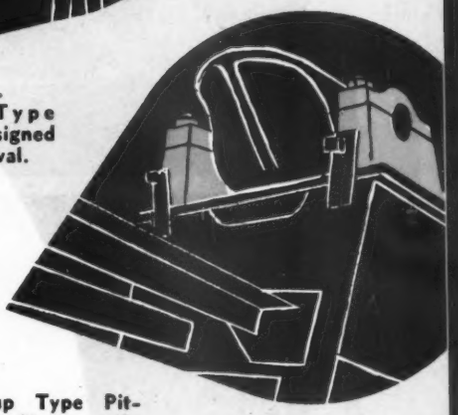
*Imperial Oil, Ltd., Photo*

LEE C. Moore

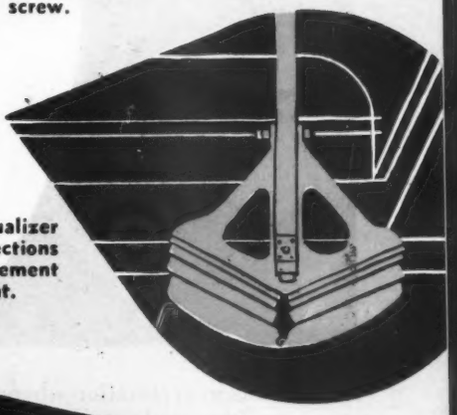
# CHAIN DRIVEN PUMPING UNITS

## WITH PATENTED CHAIN ADJUSTER

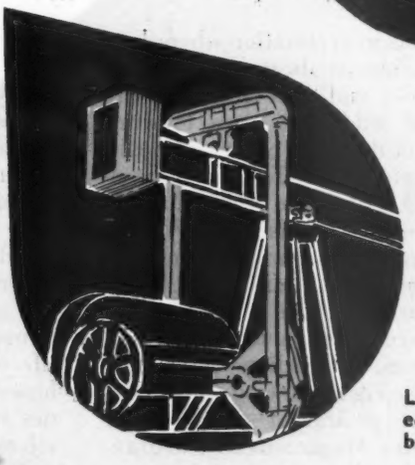
Lift Off Type Mulehead designed for easy removal.



Stirrup Type Pitman slips easily over wrist pin bearing. Tightened with single screw.



Pitman & Equalizer pinned connections have arrangement for adjustment.



Larger units are equipped with roller bearing side irons.

Units fully beam or crank counter-balanced.

Nine horsepower units and over, have anti-friction equalizer bearings, heavy welded steel case and frame.

Double Chain Reduction of approximately 24:1 ratio permits large range of pumping speeds, with various speed prime movers. Extra heavy chains insure long life under severe conditions.

All shafts roller bearing mounted, rated to give long life under heavy loads.

Patented chain adjuster slacks or tightens both chains simultaneously, holding shafts parallel.

# LEE C. MOORE CORPORATION

TULSA • DALLAS • HOUSTON • MIDLAND • SHREVEPORT • WICHITA • CENTRALIA • PITTSBURGH

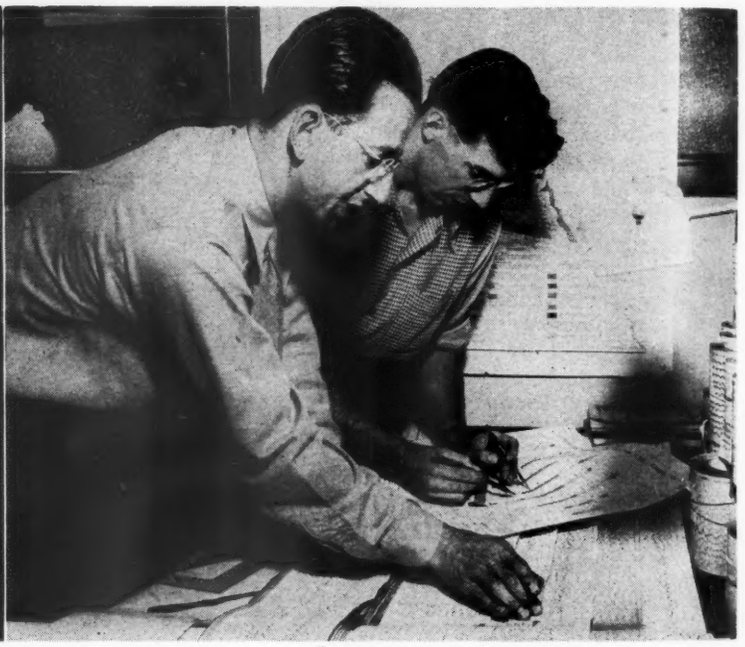
Export Office — 9 Rockefeller Plaza, New York 20, N. Y.

Just before he sets off a "man-made earthquake" Bill Flegel checks with the waiting seismograph operators by short wave radio. Their instruments will measure vibrations from underground formations.

Raymond Cox, electrical engineer, operates the delicate instruments of the seismograph, which record underground vibrations set off by "man-made earthquakes." (Lower left)

This picture, taken in the Edmonton exploration office of Imperial Oil shows seismologists computing the records of the man-made earthquakes which they set off.

*Imperial Oil, Ltd., Photo*



nadian prairie exploration where base camps are almost always situated in a nearby town and there may be a trip of several miles into town to draw water from the town cistern or wells.

Wind shields have been used extensively and have gone through many elaborations. An Edmonton, Alberta firm* turn out a complete tent that covers the whole rig and truck. Some shields just cover the bottom of the mast. There is not much uniformity about them, depending rather on whether the rig is working on exposed wind-swept prairie or on protected bush country. Magnetometer and gravitymeter crews this winter used canvas-covered jeeps as long as snow conditions were not too severe. In the early winter they were equipped with aircraft tires for wide-treaded traction. These had to be abandoned when the snow got deep, and the crews switched to "Bombardiers"—large snowmobile-type vehicles with continuous tracks.

*Hargreaves & Dick.

Bombardiers proved satisfactory except that they do not turn around easily. On all types of exploration roads have to be cleared by the crew or the oil company. Contract crews are generally provided with the snow clearing machinery by the company they are contracted to: This is a standard contract provision. Bulldozers were commonly used last winter, sometimes two to a party. Most Canadian prairie roads are not cleared effectively by public maintenance, hence it is a matter of individual parties having to clear ahead of themselves a good deal of the time.

Several months on one location was not uncommon, with the party based in a town running a limit of about 15 miles from base. All mobile equipment was put under cover every night whenever possible, otherwise starting would have been very difficult and caused loss of time. According to Tide Water's Canadian manager H. M. Kirk, in Regina, Saskatchewan the most objectionable feature of Saskatchewan operations was the necessity to do continuous profiling because of the short distance limit. Normal summer and fall radius from base will run up to 45 miles.

For any reader not familiar with Canadian winters, it must be mentioned that the snowfall is often 4 ft or deeper on the level and it is not at all unusual to have drifts up to 20 ft or more after blizzards. This applies right across the southern plains of Alberta and Saskatchewan.

These of course are all mechanical problems. For the crews, the biggest concern is morale. This factor weakens very quickly in geometric ratio to the rate of temperature decline. At 40 F below zero it takes about 95 per cent of a man's energy to keep himself warm. Most of the seismic crews were able to operate at 30 below last winter. or 10 deg lower than their normal minimum the winter before. Wind is a serious factor, and its chilling effect

# CANYON REEF
# IN KELLY SNYDER FIELD
# SCURRY COUNTY, TEXAS

19

Mud (Quebracho & Caustic): $R_m$ = 0.45 at BHT
Bit Size: 8¾"
Spacings: AM = 10'
AO = 24'
Limestone = 32"

## LOG ANALYSIS

**1) Water Saturation S**

$R_o$ is unknown. Interpretation follows pattern outlined in Example No. 9 of this series.
$R_i$ = 72 ohms — 10" Normal corrected
$R_t$ = 72 ohms — 24' Lateral corrected
SP = –100 mv.

At Level A: $\frac{R_i}{R_t} = \frac{72}{72} = 1$

S = 15% — See chart below

**2) Formation Water Resistivity $R_w$**

$SP = -90 \log_{10} \frac{R_m}{R_w} = -100$ mv.

$R_w = \frac{0.45}{13} = 0.035$ ohmmeter at BHT

**3) Porosity p**

$R_t = \frac{F \times R_w}{S^2}$ ; $F = \frac{72 \times 0.15^2}{0.035} = 46$

$p = \sqrt[m]{\frac{1}{F}} = 16.0\%$ m = 2.1

**4) "MicroLog"* — The "MicroLog" indicates the permeable porous zones very precisely.**

## CORE ANALYSIS (at Level A)

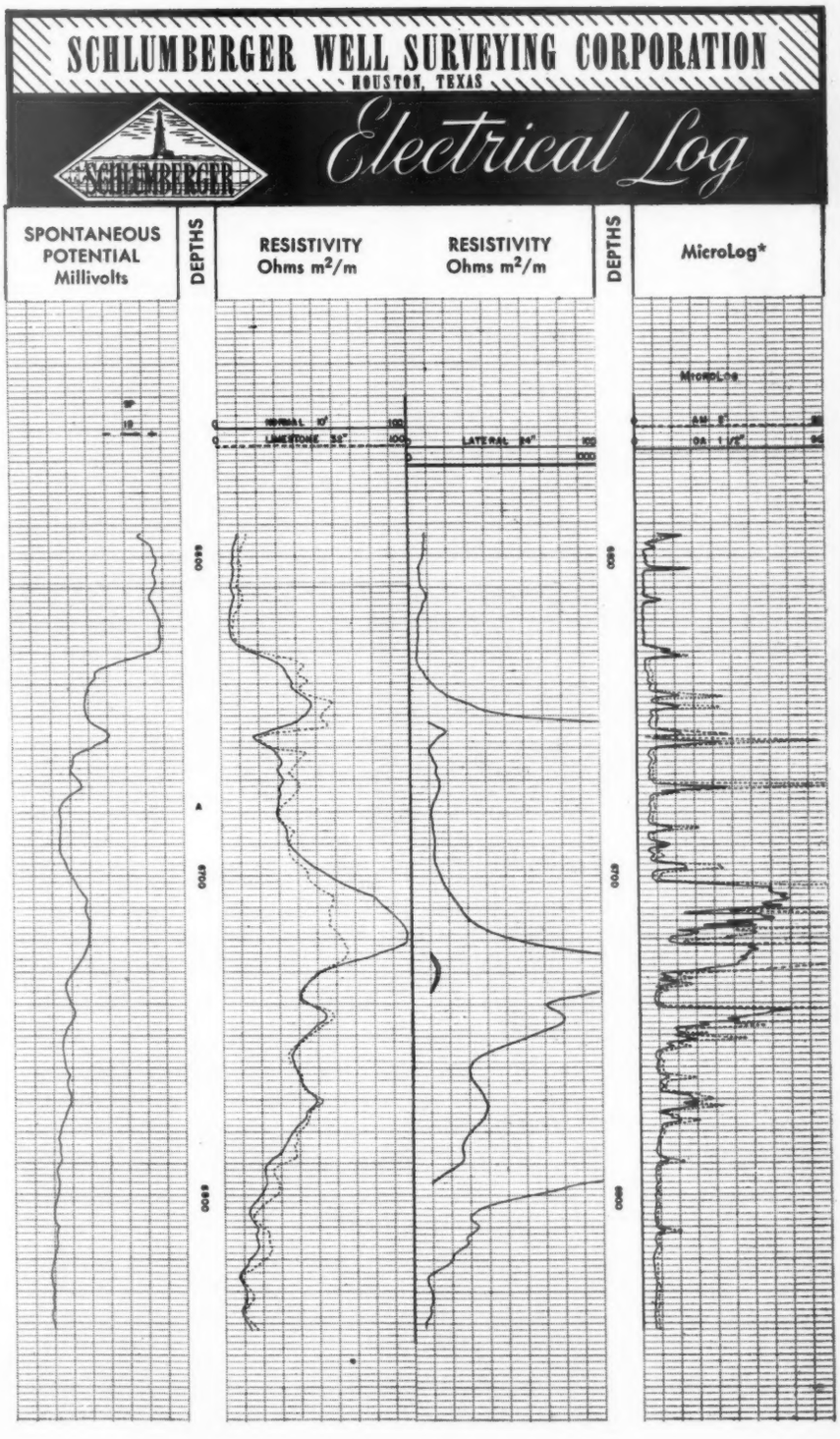
Average Porosity: 15.6%
Water Saturation: 16.6%

## PRODUCTION RESULTS

| | |
|---|---|
| Perforated: | 6800' to 6836' |
| Initial Production | 698 BOPD, 43.4° API |
| Gas/Oil Ratio | 673/1 |

*"MicroLog" is a trade mark of the Schlumberger Well Surveying Corp.

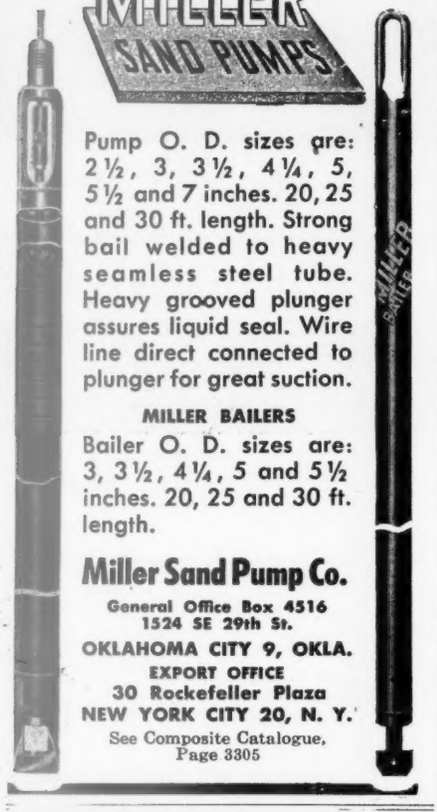
SCHLUMBERGER WELL SURVEYING CORP.
HOUSTON




SCHLUMBERGER'S PROGRESSIVE PROGRAM OF RESEARCH AND ENGINEERING PROVIDES CONSTANTLY ADVANCED SERVICES TO THE OIL INDUSTRY

**INCREASE PRODUCTION**
**Clean Out Better With**

**MILLER SAND PUMPS**




Pump O. D. sizes are: 2½, 3, 3½, 4¼, 5, 5½ and 7 inches. 20, 25 and 30 ft. length. Strong bail welded to heavy seamless steel tube. Heavy grooved plunger assures liquid seal. Wire line direct connected to plunger for great suction.

**MILLER BAILERS**

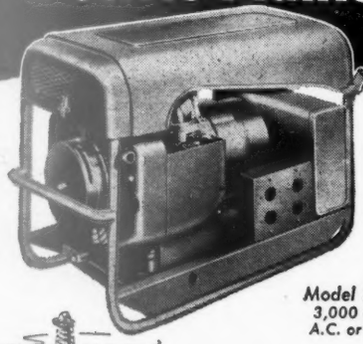
Bailer O. D. sizes are: 3, 3½, 4¼, 5 and 5½ inches. 20, 25 and 30 ft. length.

**Miller Sand Pump Co.**

General Office Box 4516
1524 SE 29th St.
OKLAHOMA CITY 9, OKLA.
EXPORT OFFICE
30 Rockefeller Plaza
NEW YORK CITY 20, N. Y.

See Composite Catalogue, Page 3305

**ONAN *Oilfield***
**Electric Plants**



*Model 3CK*
*3,000 watts*
*A.C. or D.C.*

**HEAVY-DUTY PORTABLE & STATIONARY MODELS**
***Diesel, Gas, Gasoline-powered***

● ONAN oilfield electric plants provide dependable light and power for oil field applications. A complete range of A.C. and D.C. models... all conservatively rated for continuous, dependable service helps you choose the right plant for the job. Lightweight, air-cooled models from 400 to 5,000 watts; heavy-duty, water-cooled, gas-gasoline-driven plants from 3,000 to 75,000 watts. Air-cooled Diesel electric plants 2,500 and 5,000 watts. Water-cooled Diesels from 12,500 to 75,000 watts, powered by IH engines.

*Write for Literature*

**D. W. ONAN & SONS INC.**

5371 Royalston Ave., Minneapolis 5, Minn.

on hands that have to be uncovered to record readings reduces efficiency just as much as lower temperature.

Morale on the plains operations was much improved by improving personal equipment. Cotton face masks were almost universal, and a new development was a chamois mask with a lucite panel that fits right over the head like a diver's helmet. The generic test of capacity to keep on working is: "How fast do things cool?"

Saskatchewan and Alberta plains operations were fortunate in having a steady but moderate cold without extremes, generally not much below —20 deg at night and hovering around zero in the daytime. Tide Water had four contract crews working various Saskatchewan areas and output for the first quarter of 1950, the most severe winter period, was 70 per cent of the last quarter of 1949, which included a very open and moderate autumn season. This was considered exceptionally good.

The northern bush operations, which included all the muskeg, presents more morale than mechanical problems, although the generally lower temperature range also means more time off the job due to temperature below the working minimum. The chief mechanical problem is absence of towns and service for vehicles. The typical northern bush camp includes its own self-contained machine and service shop. As it is not feasible in most cases to build sheds and heat them for all vehicles, normal practice is to keep two or three under cover and heat, and use them to tow the others for starting.

Trailer manufacturing companies located in Calgary and Edmonton have produced specialized units designed specifically for northern work. One manufacturer* has an integrated line including service, kitchen, dining, utility, and bunkhouses. The camps are larger than the usual seismic camp, comprising about 27 or 28 men in many cases.

Morale includes both resistance to weather and resistance to isolation. The short period of operation has probably been a good element in the latter. It will be possible to gain a great deal more information on this score during year-round operations.

Control in running the survey lines is one of the big operational problems in the north, says Lorne Falconer, field superintendent for Bear Oil. Snow, deadfall, and "brules" (remains of forest fires, which leave piles of burned trees stacked up several feet deep and criss-crossed) are hazards for movement. Base lines run by the federal government survey parties fifty or more years ago are mostly missing and the parties have to build their own control and base lines. Detailing cannot follow a grid pattern as it can on the plains, because the crews have to detour for contours of the ground, deep river valleys, thick bush, etc. The deep valleys with heavy alluvial material also complicate the problem of drilling the shot holes.

The "air shooting" method developed by Thomas Poulter, has been tried in muskeg country of northern Alberta. Results obtained were presented in a symposium held at the last S.E.G. annual convention in Chicago.

*Northwest Industries-Hoover Machine Company, Ltd.

## Petroleum Branch, AIME Holds Annual Session

Sessions on well logging, core analysis and flow research, phase relationships, field performance histories, production operations, relative permeability, gas technology, drilling technology, and field performance under fluid injection make up the annual fall meeting of the petroleum branch, American Institute of Mining and Metallurgical Engineers, being held in New Orleans, Louisiana, October 4-6.

A diversified program of 36 papers, written by outstanding engineers and research men in the petroleum industry, has been arranged for the 3-day meeting. A three-hour session on economics of petroleum production features talks by John R. Fairlie, manager of the coordination and economics department of Imperial Oil, Ltd., Toronto, Canada, who is speaking on "The Significance of Recent Canadian Oil Developments," and a discussion of the present and potential LP-gas market by H. R. Thomas and W. R. Thorne of Stanolind Oil and Gas.

L. S. Wescoat, president of The Pure Oil Company, Chicago, Illinois, speaks on "Petroleum in Peace and War" at the welcoming luncheon in the Roosevelt Hotel.

In New Orleans, petroleum branch chairman John E. Sherborne, assistant to vice president of the Union Oil Company, is presiding at the welcoming luncheon. General chairman of the meeting is Carl E. Reistle, Jr., Humble Oil and Refining. Other officials of the meeting are Fred E. Simmons, Jr., Louisiana Land and Exploration, chairman of the AIME Delta section; Earl Kipp, California Company, general arrangements; E. N. Van Duzee, Shell Oil, vice-chairman of the Delta section, and E. N. Dunlap, California Company, advance arrangements.

Lightweight tracked vehicles used by a party in the bush country contain all of the apparatus needed for shooting and recording.

*EXCLUSIVE*

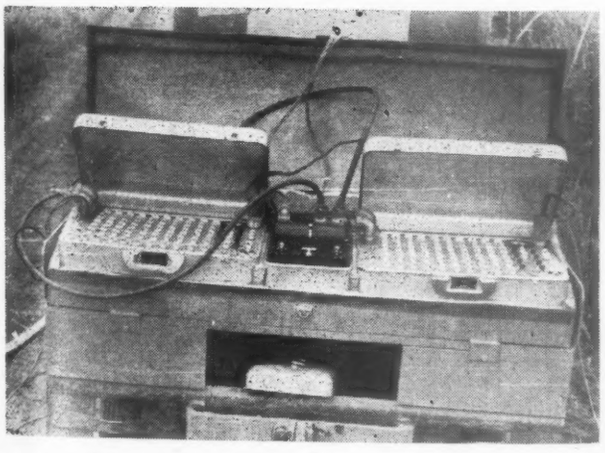
# Seismograph Operations in North Alberta's Bush Country

E. JOE SHIMEK*

THE winter of 1949-50 in Western Canada emphasized the fact that a geophysical program must be planned with unusual weather conditions in mind. Heretofore, the winter months were considered the best months for conducting seismograph operations in the bush country. The bush country of Northern Alberta, consisting of vast areas of forest, marshy prairie, and muskeg, usually freezes up in October.

The average daily temperature ranges from slightly above zero to 30 below from October to April, when the spring thaw begins to occur. Under these frozen conditions, "dozers" can operate in all types of terrain, breaking trail over which conventional geophysical parties can carry on until thaw. Thus many geophysical

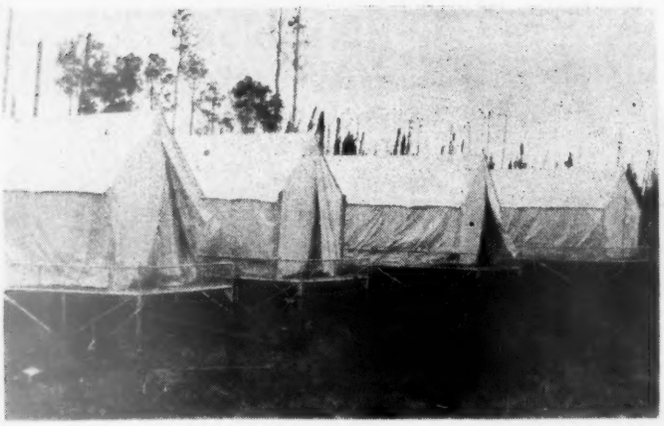
*Geophysical Associates of Canada, 217 Alberta Corner, Calgary, Alberta.



A portable 20-channel seismograph recording instrument used in Canada is mounted on the rear of a tracked-trailer.

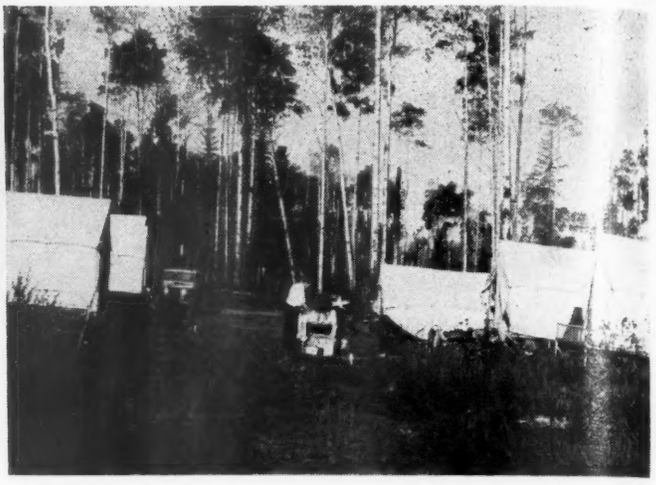
Above, right, another view of the recording instrument trailer showing the developing hut (right). The weight of the equipment is reduced to a minimum for portability.

Right, a lightweight shot hole drill operated by two men. Mud pump is at left. Drill stem is turned by a small air-cooled engine.



Crew tents can be collapsed and skidded in "trains" from one campsite to another in a relatively short time and can be set up quickly without much difficulty.

"Main street" in a geophysical party's camp in Northern Alberta, Canada. Tents are heated during cold weather by small stoves.



The crew moves a frame of poles ahead of the party's equipment train in some swampy muskeg country of Western Canada. It is obvious from these photos that progress in such areas might be painfully slow through the soft, boggy country during warm weather.

Lunchtime for the "road gang" of a Canadian exploration party.

Preparing for another 20 ft of progress across a muskeg swamp.

## "WILSON..? Yes, Sir, WILSON is the World's Best! We know—we've sold and serviced WILSON Rigs for many years!"

SUPERIOR comes by its name honestly for it has established a fine reputation for providing a type of service nothing short of superior. To adequately service the world's famous line of Wilson Rigs and Winches, SUPERIOR has expanded its facilities to include field and shop repair service supervised by factory-trained personnel; modern equipment that does a quicker and more precision job; and a complete parts department to prevent costly delays if a Wilson unit should need a new part. SUPERIOR is another example how WILSON provides on-the-spot attention to keeping those rigs and winches operating and making money — the oil country over!

Sam W. L. Backus, Vice-President and General Sales Mgr. | T. C. Poindexter, Vice-Pres. and Gen. Mgr., Fabricating Div. | A. M. Croswell, Chief Engineer, Fabricating Div.

These men are the "stemwinders" behind that go-getting SUPERIOR Iron & Machine Works' service. If you don't already know them, make it a point to meet them. They'll go all out to service a WILSON owner.

*SEE THAT NEW*

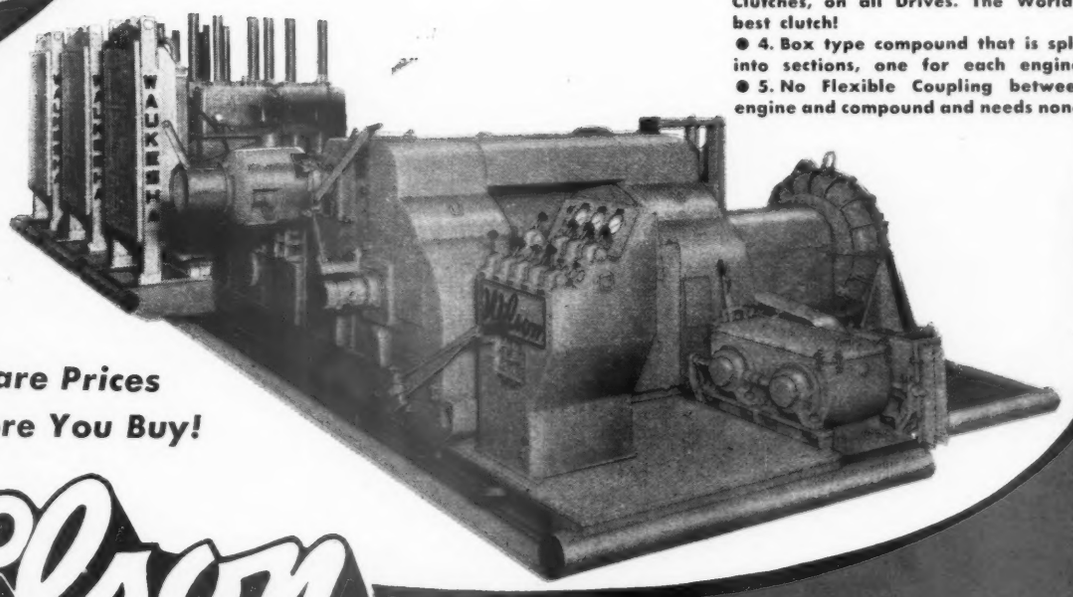
# Wilson

## GIANT TORCAIR-ROADAIR RIG NOW!

SUPERIOR HAS COMPLETE LITERATURE AND INFORMATION

**FIVE STAR FEATURES — *Exclusive to Wilson!***

- 1. Designed to operate either with or without torque converters.
- 2. Four Friction Clutch Speeds to the Drum.
- 3. Equipped with Air-Tube Disc Clutches, on all Drives. The World's best clutch!
- 4. Box type compound that is split into sections, one for each engine.
- 5. No Flexible Coupling between engine and compound and needs none.



*Compare Prices Before You Buy!*

# Wilson MANUFACTURING COMPANY, Inc.

FACTORY AND GENERAL OFFICES: WICHITA FALLS, TEXAS

programs required in the bush country were planned only on a winter basis.

### Heavy Freeze Delayed

Programs initiated in September 1949, were delayed in rate of execution all through the months of September, October, November, and a part of December, because a heavy freeze-up did not occur until just before Christmas. Then, the temperature dropped to 40, 50, and even 60 below, and stayed there until the end of January!

Operation of automotive, drilling, and exploration equipment designed for use at 10 to 20 below zero, was very difficult, when temperatures were 40 and 50 below. The months of February and March 1950, were ideal, however, in that, temperatures held around 10 below zero. Thus, of the 6 months during which bush country work should have been relatively economical, only 2 months were ideal.

New oil discoveries and prospects in Northern Alberta, trending upward toward the Arctic, together with Provincial exploration obligations, dictated that geophysical programs should be capable of execution in all types of terrain under all conditions of weather. Thus, the summer months brought about the development and use of equipment adapted to the bush country under summer conditions.

### Summer Operations

In the summer some muskegs will not support the weight of a man, rains make much of the soil quite soft, and supplies must be transported by light tracked vehicles, pack trains, barges, or parachutes, depending on the location of a party's camp.

The accompanying photographs show various phases of a seismograph party operating in bush country. Some of the camp units are shown in the accompanying photographs. All units are identical in size. Each bunk unit houses 4 men. Identical sleds and tents are used for the kitchen unit (complete with propane stove, cooking utensils, etc.,) and the materials storage unit. Each unit is provided with a tow in front and a hitch behind. On wet terrain, a train of 2 or more units may be formed behind the towing vehicle.

### Camp Easy to Move

Collapsible tent standards and ridge poles enable the entire camp to be collapsed and ready for towing to a new site in a matter of minutes without recourse to elaborate packing of camp equipment. Skid areas are such that the unit pressure on the ground is less than that of an average man. Camp mobility is an essential factor in maintaining short camp-to-field distances as a job progresses.

The basic work unit on a seismograph party is illustrated. Tractors are provided with endless tracks. These units tow trailers similarly equipped. This combination serves as a recording unit, shooting unit, water tank unit, or drill unit. Shooting, water, and drill units are identical in being provided with water tanks and utility boxes. In the event of a breakdown of any one of these units, a similar unit being used for a different operation may be pressed immediately into the service that has current priority.

A close-up view of the recording unit is shown. This comprises a set of portable 20-channel instruments, developing hut, geophones, portable cables, etc. All equipment may be carried by manpower through the bush should the need arise.

With the exception of the tents, all of the vehicles and equipment shown will be utilized under winter conditions of operation after suitable conversion. Because of the constantly changing nature of the terrain and weather, men and equipment must be adaptable to any situation. ★ ★ ★


*In the American Tradition*

PRESERVE YOUR FREEDOM!

Political and economic freedoms go together. What harms one automatically hurts the other. That's why we must prevent anything from interfering with our free, voluntary system that allows every American to choose his own vocation . . . to compete for jobs and customers . . . to spend, save or invest his money . . . to invent and improve and receive the fruits of his labors and risks.

We must also make sure that enough profit is gained on successful investments to offset the risk of loss on investments that fail. Otherwise the incentive to invest in new businesses, new inventions, new products—the "hope of profit" that enabled us to produce the world's highest standard of living—will be lost . . . and our free economy will slowly but surely grind to a halt. If that happens our free choice will also be lost.

Let's not let it happen.

Get Maximum "Footage-per-Dressing" with SPANG Heat-Treated DRILLING BITS

The HIGHER STANDARD

SPANG CABLE TOOLS made by SPANG & CO. BUTLER, PA.

for

OIL WELLS • GAS WELLS • ARTESIAN WELLS
SHOT BLAST HOLES • PROSPECT DRILLING

SPECIFY SPANG—FOR SALE BY DEALERS EVERYWHERE

## Permian Oil Basin Show in Odessa, Texas

Drilling and production equipment ranging from diamond bits to sucker rods and Christmas trees to supercementers will be displayed at the 1950 Permian Basin Oil Show in Odessa October 19-22.

The overflow of firms wanting inside exhibit space necessitated securing a 70 by 50-ft tent to supplement space available for oil and oil-associated exhibits inside three large exposition barns.

The number of exhibitors totalled 145 in late August when the show was still nearly two months away. About 50 outside spaces ranging in size up to 55 by 105 ft will be used for large gear like drilling engines, cementing and acidizing equipment, and other heavy goods.

The four-day show will coincide with the last days of Oil Progress Week, annual report period of the nation's oil industry. The educational angle will be stressed in exhibits by the American Petroleum Institute's Oil Industry Information Committee, the West Texas Geological Society, the National Safety Council and the Texas University Division of Extension.

Odessa, situated in the heart of the richest oil region in the world, will make special efforts to encourage the man in the field to attend the show. It is called the "oil field workers' show" and is designed to give the lease hand and the driller a chance to see new types and adaptations of the tools and services he utilizes from day to day.

The show will also provide for the exchange of technical information valuable to men in the industry and will afford the business man, the housewife, and the school child opportunity to understand and appreciate what the oil industry is and how it operates.

The Permian Basin chapter of the API, largest unit in the production division, will have a barbecue meeting the opening night of the show with a prominent speaker. On the following night, October 20, the American Association of Oilwell Drilling Contractors, West Texas Geological Society, and American Institute of Mining and Metallurgical Engineers will have a joint gathering. Members of the Texas Railroad Commission will be invited as special guests to this function.

A barbecue by Odessa's Chuck Wagon Gang is expected to attract an estimated 30,000 persons October 21. This figure is based on the fact that the same gang of goodwill servers fed more than 15,000 at the last oil show in Odessa in 1941 when the city was a third its present size.

H. E. (Eddie) Chiles, Jr., of Midland, president of The Western Company and prominent in Permian Basin oil circles, will be chairman of ticket sales to the barbecue and the other entertainment. This will include five dances nightly to bands like Henry Bussey and two-a-day vaudeville performances. Nightly fireworks displays will be free as will admission to the grounds at all times.

Lloyd French

H. E. Chiles, Jr.

Lloyd French of French Tool and Supply Company, Odessa, is president of the board of directors, which represents almost every community in the West Texas and New Mexico oil country. Vice president is Early N. Spiars of Spiars and Wells Equipment Company, Midland and Odessa; treasurer is Roy E. Carter with the Amon G. Carter Foundation, Kermit, and secretary-director is Houston Crump.

Submersible Drill Barges-

"A COMPLETE PACKAGE"
BY
Levingston

From crown block to barge bottom, Levingston is prepared to accept the entire responsibility of constructing and rigging-up your submersible drill barges on a turn-key basis. You select the tools, or equipment, and Levingston's experienced organization will install them for safe and efficient operation on marine locations.

SAVE "DOWN TIME" ON MARINE DRILLING EQUIPMENT REPAIRS

Levingston know-how and dry dock facilities provides the industry with a conveniently located repair yard for all types of marine drilling equipment . . . from LST's to drill barges to oil barges.

Levingston SHIPBUILDING CO. • ORANGE, TEXAS

Day Phone: 8-3521 • Night Phones: L. J. Vincent, Repair Superintendent, Ph. 8-4516 • George Duchamp, Ass't. Repair Superintendent, Ph. 8-4841.

# New Formation Fracturing Service Announced

A NEW, simplified method for fracturing formations to increase production has been announced by a firm* engaged in the application of chemical services to the petroleum industry.

The new process† utilizes a thickened hydrochloric acid‡ to increase production from formations that do not respond readily to conventional acid treatment. The thickened hydrochloric acid is used as a formation fracturing agent and a solvent for removing acid soluble materials that may be present in the rock.

The company has treated many gas and water wells with inhibited hydrochloric acid. During early injection experiments on brine wells in Michigan, it was learned that it was possible to fracture the exposed formation and lift the over-burden, when sufficient injection pressure was obtained.

The principle of treating wells successfully in this manner was described by Dr. John J. Grebe and Dr. Sylvia M. Stoesser in August, 1935.§ They pointed out that acid may be injected into a well with sufficient pressure to counter-balance the weight of the overlying rock and to fracture the formation, providing new cracks and crevices through which acid or well fluids can flow.

In actual field practice it was soon learned that only those formations with low permeability could be fractured in this manner. Most formations were sufficiently permeable to permit the acid to enter the pores at pressures below the fracturing point.

The acid used in the new process is so thick and viscous that even in highly permeable sections, the injection pressure may be built up to a point where fracturing will occur.

The acid is carried to the job in the form of two non-viscous solutions that are pumped into the well simultaneously. As all the chemicals used are dissolved previously, no time is lost in preparation on location. The two solutions are mixed at the discharge of the pumps, forming the thickened acid in the tubing.

As this viscous material does not have to pass through the pumps, a wide range of viscosities may be used to meet specific well conditions.

When the viscous acid starts into the formation its resistance to flow is great. Consequently, sufficient pressure can be developed to cause fracturing. Within 3 to 4 hours after mixing, the viscous acid thins down to a water-like consistency that flows back into the well bore when the well is put on production. * * *

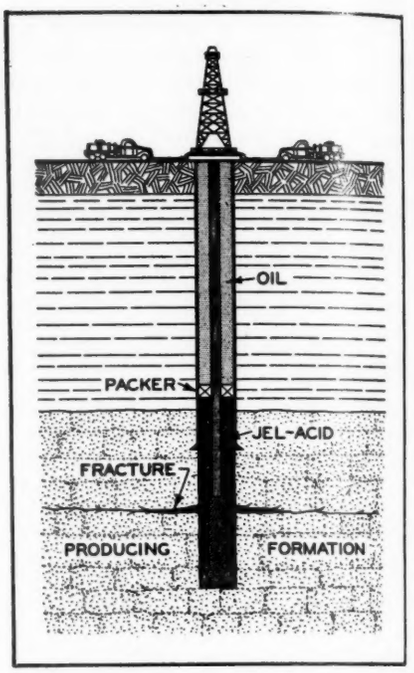
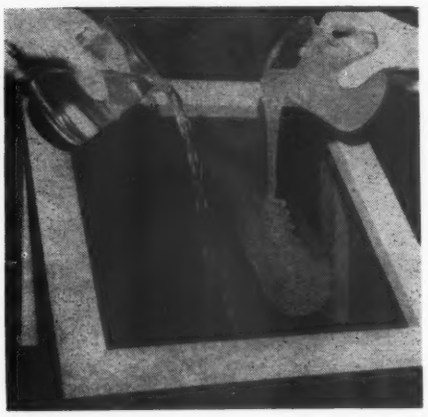



Diagram showing method of fracturing rock.

Freshly mixed Jel-Acid, in the right-hand beaker, is too thick to pass through ordinary window screen. After several hours it thins to the free-flowing liquid at the left.



*Dowell Incorporated, Tulsa, Oklahoma.
†"Stratalift".
‡"Jel-Acid".
§In World Petroleum.

# Maintain Corporate Plan, Nickerson Urges NPA

The present corporate structure of the domestic oil industry—with both integrated and independent companies—must be maintained if the American people are to be assured a steady supply of petroleum products at reasonable prices, the National Petroleum Association was told at its 48th annual meeting in Atlantic City, New Jersey, September 13.

A. L. Nickerson, director in charge of domestic marketing, Socony-Vacuum Oil Company, Inc., New York, pointed out that the nation's oil men are plagued constantly with "irresponsible suits," and that they must fight them and simultaneously continue their program of establishing public confidence and understanding of their operations.

The Socony-Vacuum marketing expert said the American people have no real conception of the legal confusion, which leads to seemingly contradictory complaints being brought against the industry. They only see that supposedly responsible agencies bring the suits. As examples of the confusion, he cited the recent suit in which the Federal Trade Commission sued Standard Oil Company (Indiana) for not having a resale price maintenance policy, and the suit in which the anti-trust section of the Department of Justice sued a number of West Coast oil companies for having such a policy.

He said that if the present corporate structure is altered—if integrated companies are broken up, costs and therefore prices would be increased all along the line; the quality of products would fall or remain static because no company would be large enough to maintain a broad research program; and the flow of products to the consumer would be irregular because the various operations of production, transportation, refining and marketing could not be coordinated as they must be to achieve good distribution. * * *

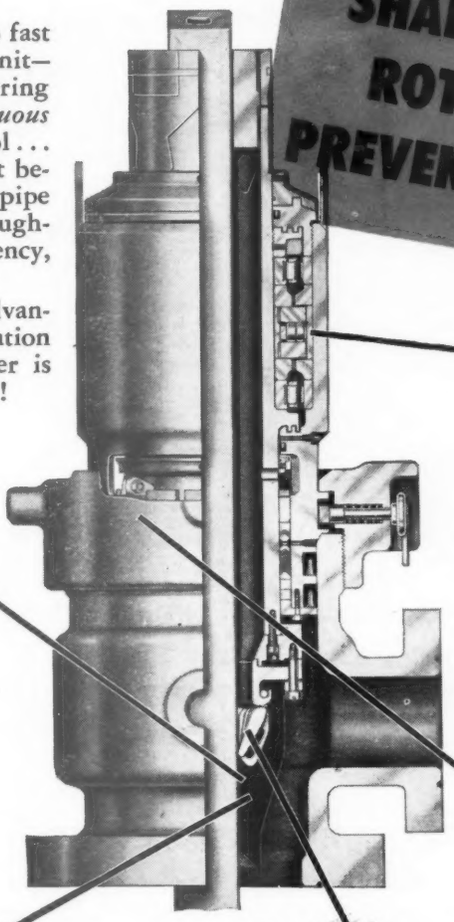
# No other pressure control equipment gives

# SUCH COMPLETE PROTECTION

## AS THE SHAFFER COMBINATION ROTATING BLOWOUT PREVENTER AND STRIPPER

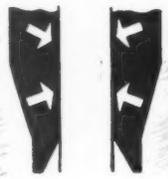
EMERGENCIES just can't happen too fast for this unique pressure control unit—it is *always* sealed off around the drill string while pipe is in the hole. It affords *continuous* and *completely automatic* pressure control . . . and there's no need for special equipment because it operates with the kelly and drill pipe normally used. In every way, it meets the toughest requirements for adaptability, efficiency, simplicity and fool-proof dependability.

It will pay you to check these vital advantages... you'll see why the Shaffer Combination Rotating Blowout Preventer and Stripper is unequalled for all-around pressure control!



### SEALS ANY SHAPE

The Stripper Rubber expands and contracts *automatically* to fit the various shapes and diameters in the drill string (excepting only such abnormally large diameters as the bit and reamer). It seals off around any shape—square, hexagonal and octagonal kellys... as well as couplings, tool joints, subs, drill collars and pipe, whether upset, flush or coupled. *No manual adjustment is necessary!*

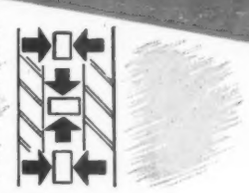


### SEALS CONTINUOUSLY

A pressure-tight seal is maintained at *all* times without need for applying mechanical or hydraulic pressure of any kind from the outside . . . and the seal is self-adjusting to the varying shapes and sizes in the drill string. The operator can *drill* under pressure, and can also *strip* pipe in and out of the well under pressure—*all without adjustments or changes in the unit!*

### AMAZING COMPACTNESS

Space-saving compactness of the Shaffer Combination Rotating Blowout Preventer and Stripper reduces vertical height requirements and permits installation even under the most difficult space limitations. Even the flow connections are built directly into the body, thus simplifying hook-ups and eliminating need for spools or other equipment for overflow connections!

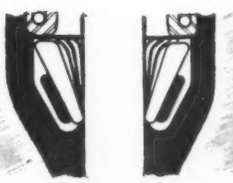


### PRACTICALLY NO WEAR

Since the Stripper Assembly rotates freely *with* the kelly—not one inside the other—there is virtually no wear on the rubber. This reduces maintenance, assures a pressure-tight seal and maximum safety. In addition, the bearing assembly upon which the unit rotates has separate thrust and radial bearings to withstand the severe loads due to high pressures and high speed drilling. Bearings are lifetime prepacked with heat-resisting lubricant.

### FAST RELEASE

Bits and reamers can be passed through the unit with maximum ease, safety and simplicity. Simply pull a spring latch, rotate the bonnet 1/6 turn and the entire internal mechanism as a unit can be withdrawn to permit removal of the bit or reamer. When going back into the hole, simply reverse the operation. It's as quick as that!



### STEEL REINFORCED STRIPPER RUBBER

A patented expandable steel barrier of flexible steel latches prevents the Stripper Rubber from extruding either by high pressures or by pulling large diameters through it. Yet normal flexure of the rubber is assured at all times!

Before you purchase *any* pressure control equipment, make sure you investigate *fully* these and the many more vital advantages built into the Shaffer Combination Rotating Blowout Preventer and Stripper. It's the most *efficient*, most *versatile*, most *positive* pressure control unit yet developed. Send for full details today!

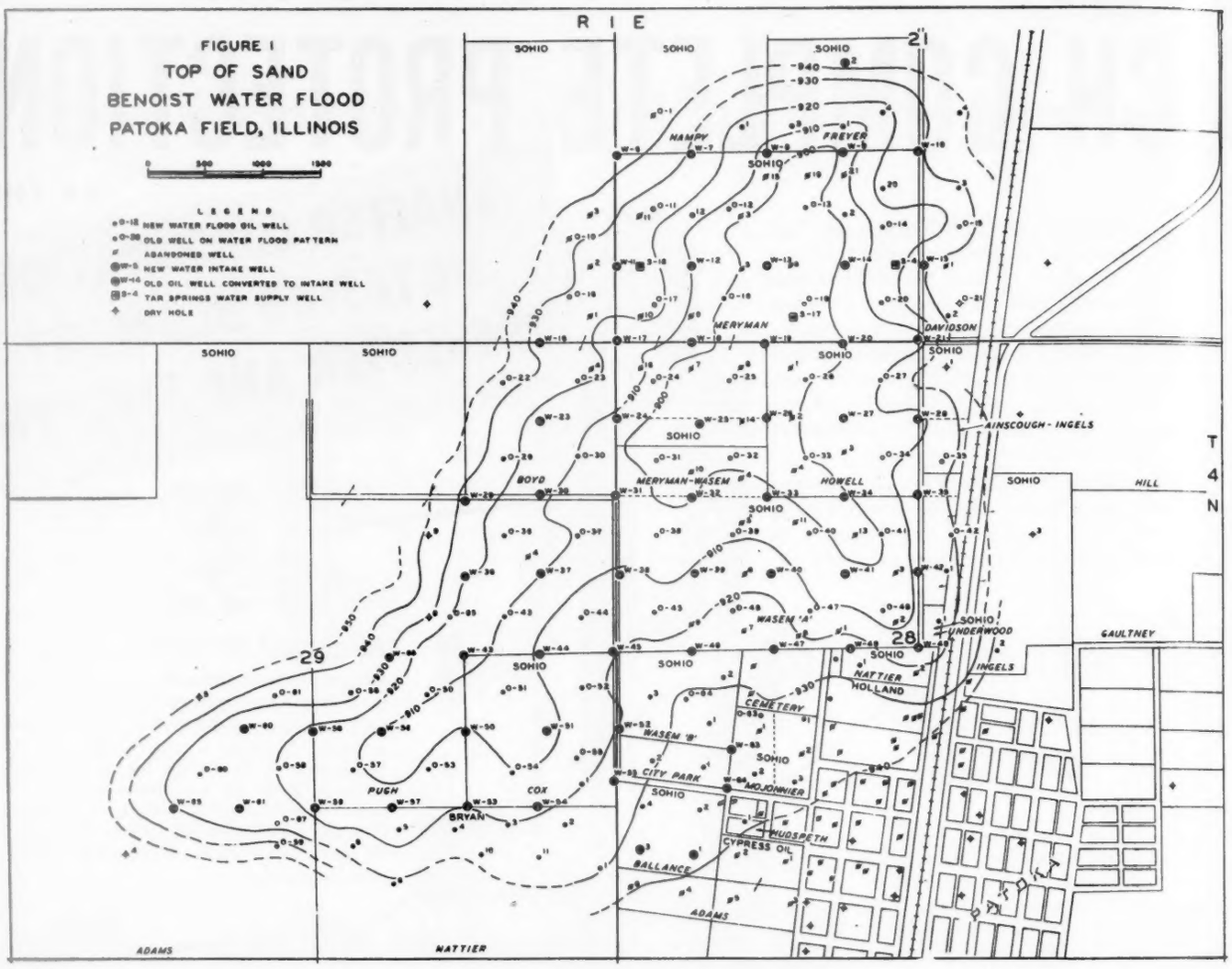
**See pages 4433 to 4496 of your 1950 Composite Catalog for helpful data on the above equipment as well as for information on the complete Shaffer line.**

**Write for your free copy of the new Shaffer Catalog!**

# SHAFFER

HIGH PRESSURE DRILLING AND CONTROL EQUIPMENT • FISHING TOOLS THAT EXCEL

SHAFFER TOOL WORKS, Brea, California • California Service Shops: Santa Fe Springs and Taft
HOUSTON, TEXAS, 6006 Navigation Blvd. • ODESSA, TEXAS, 1925 West Second Street
OKLAHOMA CITY, OKLAHOMA, Acme Oil Tool Company, 1001 S. E. 29th Street
CASPER, WYOMING, Shaffer Tool Works, Post Office Box 1788
EXPORT SALES OFFICE: Shaffer Tool Works, 500 Fifth Avenue, New York, N. Y., U.S.A.




# Patoka Benoist Water Flood†

H. S. BARGER*

THE Patoka field was discovered in February, 1937 by the completion by Adams Oil and Gas Company and Felmont Corporation of their No. 1 Meryman located in section 21, Township 4 North, Range 1 East, Marion County, Illinois. The field's discovery touched off the second oil boom in Illinois. About 100 acres of the field extended into the city limits of Patoka resulting in prolific drilling of town lot wells.

The discovery well was completed in the Bethel sandstone, locally known as the Benoist, at a total depth of 1418 ft. This well, which is one of the few wells that actually flowed, initially produced 100 bbl of oil of 39 API gravity. Within less than a month the well was put on pump and it pumped 135 bbl oil per day after a 10-quart shot.

The field was drilled on an irregular spacing pattern and a total of 132 producers were completed with about 700 productive acres. The wells initialled from 40 to 150 bbl of oil per day and a maximum field production of about 2400 bbl per day was reached in January, 1938. The production decline was very rapid but was retarded some by the completion of additional wells in 1940 and 1941.

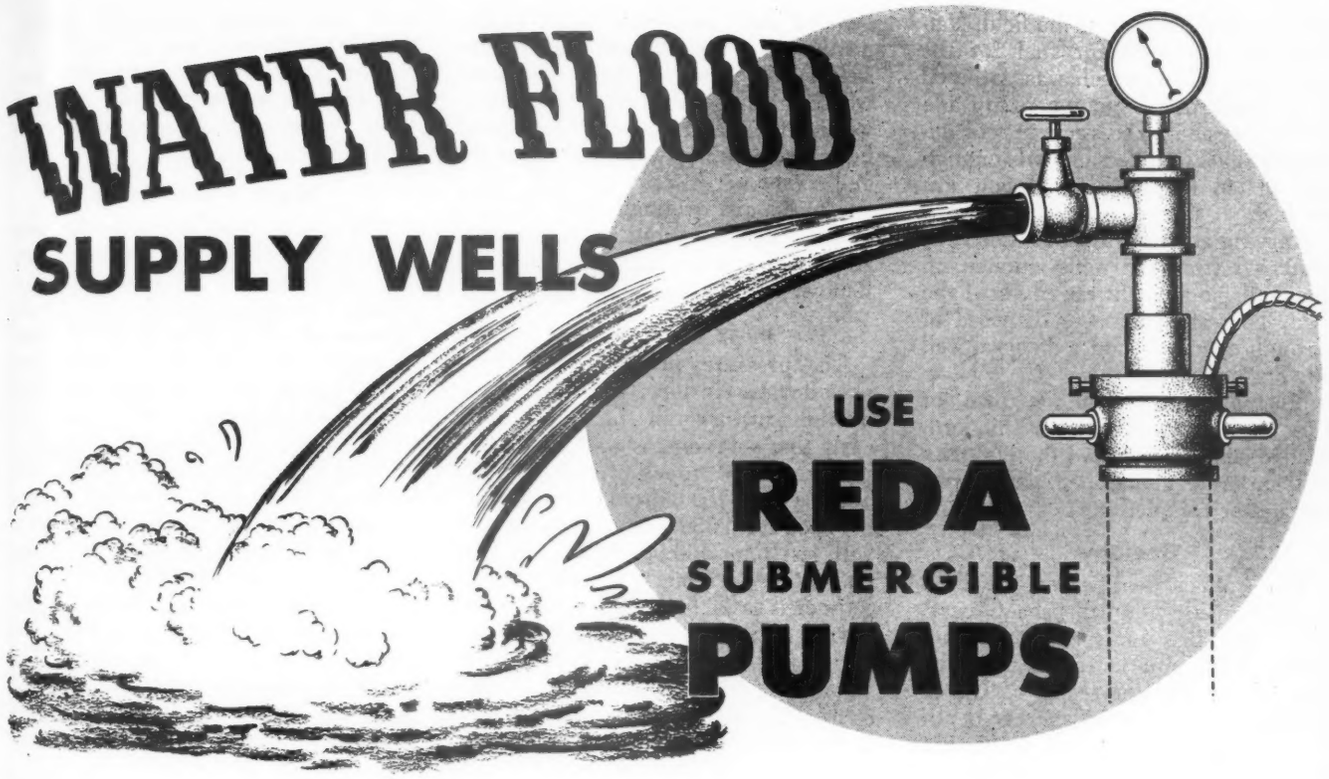
The wells were drilled with rotary and, on most of them, the sand was cored with rotary. Casing was set on top the sand and cemented with 200-300 sacks of cement. All of the early wells were completed with 5½-in. casing but some of the later wells were completed with 4½-in. casing. After cementing casing, cable tools were used to drill plug, shoot, clean out, and put on production.

Individual pumping units, powered with gas engines, were installed on most of the wells. Pull-off jacks, operated by second well attachments from the individual units, were installed on the remaining wells. In 1940, most of the field was electrified and power was furnished by a generating plant lo-

†Presented at the spring meeting of the eastern district API Division of Production, Hotel Cleveland, Cleveland, Ohio, April 28, 1950.

*Sohio Petroleum Company, Oklahoma City, Oklahoma.

# WATER FLOOD SUPPLY WELLS




**Reda Pumps are standard equipment on the majority of water flood operations in which the water supply is produced from wells. Water flood operators turn to Reda Pumps because of their overwhelming advantages over other water lifting methods.**

## THE ADVANTAGES OF PRODUCING SOURCE WATER WITH REDA PUMPS MEAN:

**LARGE CAPACITY:** The ability of Reda Pumps to produce the largest volumes obtainable from 5½", 7", and 8⅝" casing reduces the required number of supply wells.

**LOWER COST:** In *addition* to reducing the required investment in the number of water supply wells required, investment in Reda Pumps is less per barrel of daily capacity than other types of pumps. Pumping cost per barrel of water is lower. In fact, many operators find it more economical to drill wells producing brine and equipping them with Reda Pumps rather than use surface water from lakes or streams.

**CORROSION RESISTANCE:** Reda Pumps of standard construction are corrosion resistant under ordinary conditions, but special materials are available for extremely corrosive wells. Corrosion problems are substantially reduced or entirely eliminated with Reda Pumps.

**CLOSED SYSTEMS:** Many Reda Pumps are used for both producing and injecting water in closed system floods, especially during the pilot stages because sufficient capacity together with high input pressures, where desired, is available.

**FLEXIBILITY:** To fit the changing needs for water volumes as the flood progresses, Reda Pumps can readily be altered or changed to larger or smaller sizes.

**EXPERIENCE:** Reda Engineers have been closely associated with water flood operations for more than ten years and are fully qualified to assist operators in the selection of proper pumping.

**DEPENDABILITY:** Reda pumps offer sustained, dependable performance and prompt replacement service to assure the continuous operation necessary for successful water flooding.

***Reda engineers are ready to assist you in planning your water supply requirements. A letter or phone call will bring prompt results.***

# REDA PUMP CO.

BARTLESVILLE, OKLAHOMA

cated near the center of the field. Natural gas was used for fuel for the generating plant, which was gathered by a small rotary vacuum pump and vacuum system. The vacuum was automatically controlled and only enough was pulled to furnish sufficient gas for fuel.

Varying amounts of salt water were produced from the wells situated on the south and northwest edges of the field. The salt water was disposed of through open pits and a disposal well into an upper sand.

Most of the wells in the town lot area were edge wells with a thin productive sand section and the majority of them were abandoned within two years after completion.

## Geology

The Patoka field is an anticlinal structure with a northeast-southwest trend. The Benoist is the main producing sand and is found near the base of the Chester series of Upper Mississippian age at an average depth of 1410 ft. The producing formation is a lenticular sandstone of medium to fine sub-angular sand grains. It is a relatively clean sand except near the "shaled out" areas that occur in the northeast and southwest part of the field. There are several instances where shale and/or lime streaks occur within the sand section. The sand body extends into water on the south and on the northwest.

The Benoist originally had 50 ft of closure that was oil productive. A structural contour map on top the Benoist sand is shown in Fig. 1.

## Early Performance

The pressure - production history, gas-oil ratio history, and water-production history all indicated very early that solution-gas was the principal recovery mechanism. Within about a year, the bottom hole pressure dropped from 550 psi to about 200 psi with less than 400,000 bbl of oil produced. The original gas-oil ratio was estimated to be less than 50 cu ft per barrel of stock tank oil and its increase was very gradual. Little or no water was produced except from the edge wells and the amount of water produced indicated that the edgewater drive would be very ineffective.

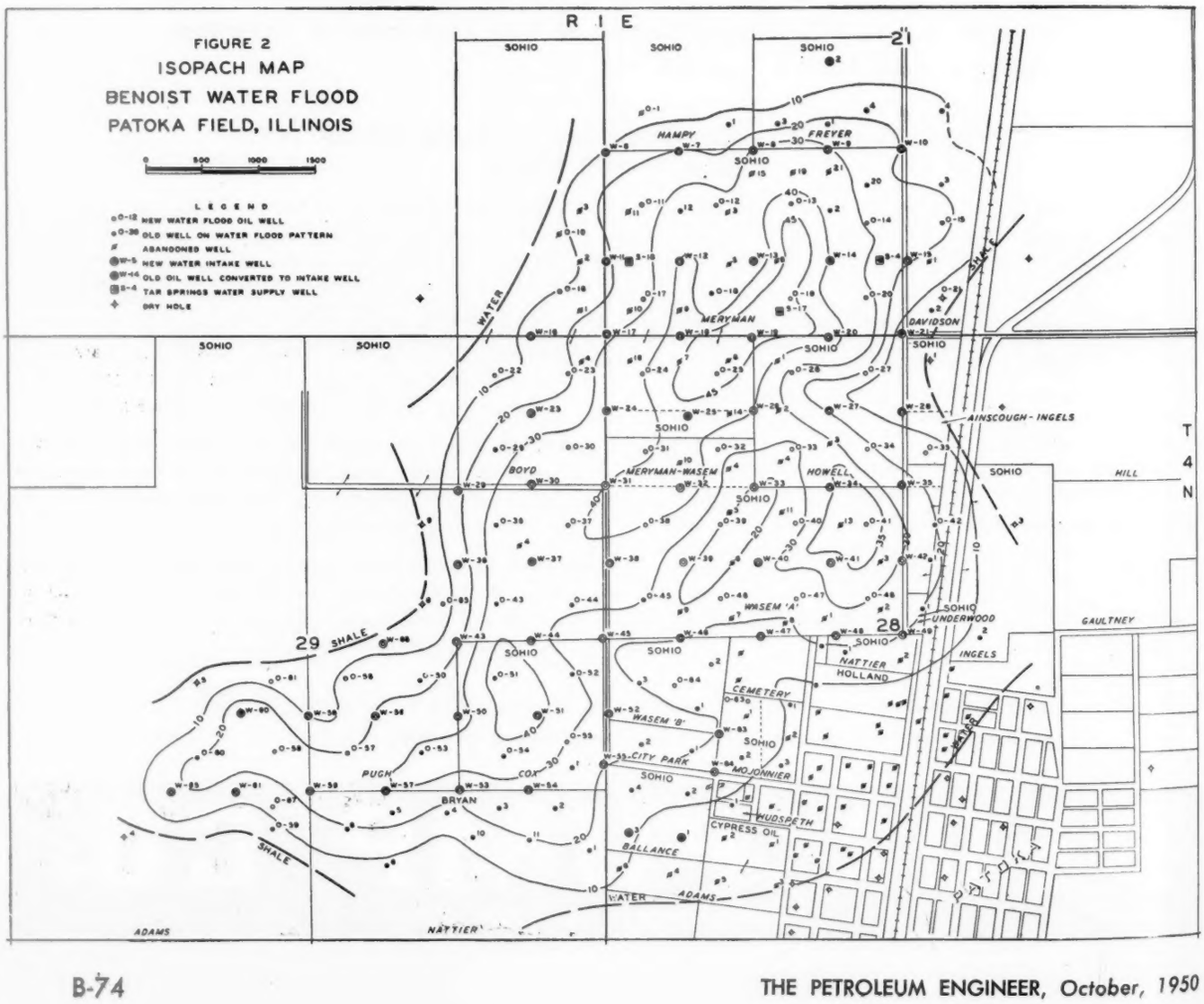
A complete analysis of the reservoir data and field performance indicated that the natural reservoir energy would only recover a small part of the oil in place. It was estimated that the natural recovery would approximate 15 per cent of the pore space or 225 bbl per acre-foot.

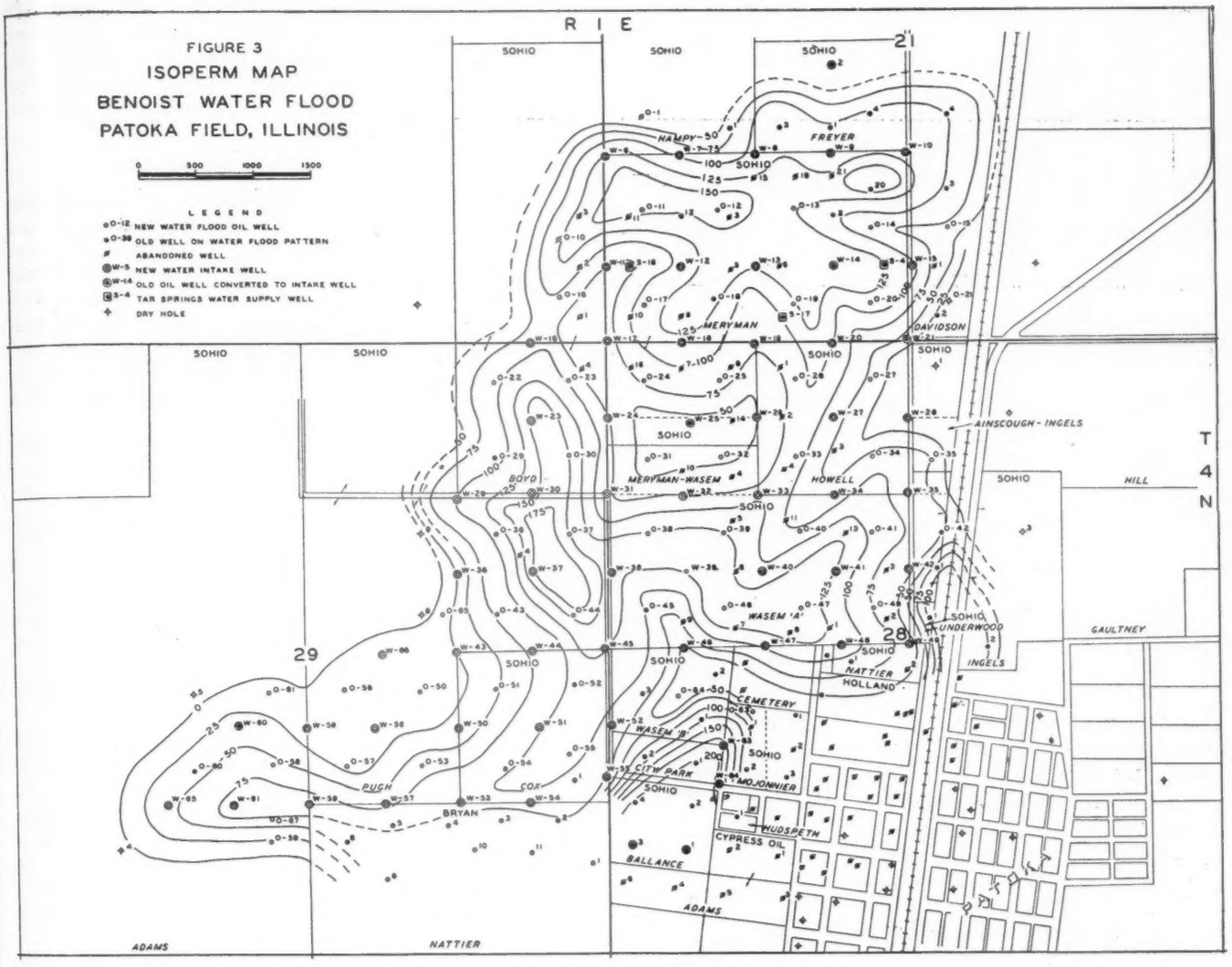
## Water Flood Study

The early field performance plus the characteristics of the sand and the produced oil led the major operator to start gathering data to determine the feasibility of early water injection. All of the field except most of the town lot area and one edge lease was developed by the major operator which simplified the problem of making a water flood study. The data and discussion presented hereinafter pertains only to the major operator's development and operation and is referred to as the total field.

Complete data were collected on the production of oil, gas and water for each lease and for the total field. Bottom hole pressure surveys and gas-oil ratio surveys were made at different intervals. Edge water encroachment was followed very closely.

In 1940 and 1941, a number of evaluation wells were located and drilled






throughout the field to determine the average reservoir fluid saturations. All of the early wells had been cored with rotary and the cores analyzed but the saturation values obtained were not considered representative of the reservoir conditions. There were indications that the rotary cores were being badly flushed by the rotary drilling mud and that the rotary core analysis only gave representative permeability, porosity, and effective thickness of the sand.

The evaluation wells were drilled by rotary but were cored with a cable tool core barrel. Both oil and water were used as a coring fluid.

### Reservoir Data

The average reservoir characteristics in 1942 as determined by all the core data from both the original cores and the evaluation cores are listed as follows:

| | |
|---|---|
| Porosity | 19 per cent |
| Permeability | 110 Md |
| Residual oil saturation | 53 per cent |
| Connate water saturation | 20 per cent |
| Water flood residual oil saturation | 22 per cent |
| Oil water transition zone | —945 to —949 ft |
| Sand thickness | 27 ft |

### Oil Characteristics

Two bottom hole samples taken from new wells drilled in different parts of the field in March, 1942, showed the oil to have a viscosity of 5.35 centipoises at a bottom hole pressure of 30 psi and 4.5 centipoises at a bottom hole pressure of 500 psi. The bottom hole temperature was 80 F and the formation volume factor was estimated to be 1.05.

### Water Flood Pattern

A number of water flood patterns were laid out for the development of the field. Some of the problems confronting the operator were:

1. The large number of small leases involved.
2. The irregular spacing pattern of the producing wells.
3. The variable sand thickness.
4. The productive limits had not been completely defined.

After a number of proposed plans were completely analyzed, it was decided that a 10-acre 5-spot pattern was the most desirable from a recovery, economic, and practical standpoint. This pattern best fitted the reservoir sand conditions and the predicted injection performance indicated that sufficient water could be injected to obtain maximum recovery within a reasonable time. The pattern also best fitted the property lines which permitted a minimum of unitization of the royalty interests. In the north part of the field it was necessary to lengthen the pattern to 15-acre 5-spot and in the south part it was necessary to use irregular spacing to fit property lines. Approximately 40 of the original wells were off pattern and were subsequently abandoned. The complete water flood pattern is shown in Fig. 1.

Fig. 2 is an isopach map of the permeable sand above the oil water contact. The isopach map shows the area of shaling out as well as the areas of edge water. The sand thickness under flood varies from a maximum of 47 ft to a minimum of less than 5 ft.

Fig. 3 is an isoperm map that shows the average permeability of the sand above the oil-water contact. The permeability ranges from zero to a maximum of approximately 600 md.

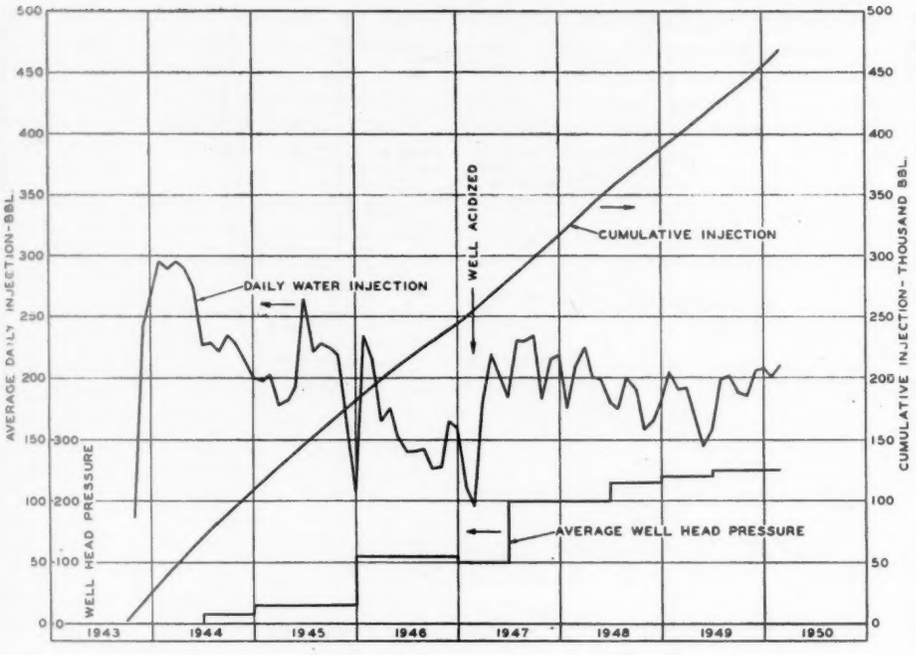



FIG. 4. Patoka Benoist Water Flood—Water Injection Performance—Meryman W-18

There are low permeable areas in the east, northwest, west, and southwest parts of the field.

### Development Program

The drilling for a pilot flood was started in April, 1943. The pilot flood area was located in the northwest part of the field and consisted of two 10-acre 5-spots and two 15-acre 5-spots. A total of 9 intake wells and 4 oil wells were completed and water was turned into the first intake wells on September 3, 1943.

In January, 1944, just three months after water was turned into the pilot flood area, the drilling for the development of the whole field was commenced. The flood area was expanded both eastward and southward by the drilling of 3 to 4 wells per month. The water flood development was completed in August, 1946, and a total of 59 intakes, 39 new oil wells, and 2 dry holes had been completed.

During 1948 and 1949 a few edge wells were added making the total water flood development include 62 intake wells, 40 oil wells, and 2 dry holes.

### Well Completion Practices

All of the wells were drilled with rotary and most of them were cored with rotary. A few of the intake wells were cored with cable tools. On the wells cored with rotary, 4½-in. casing was used and on the wells cored with cable tools, 5½-in. casing was used.

The casing was cemented with 35 to 50 sacks of cement and cable tools were used to drill plug, shoot and clean out. Each intake well was shot with liquid nitroglycerine with the shot size varying from ½ qt to 2½ qt per foot. After cleaning out, each well was hooked up with a meter, strainer, and throttling valve and in most cases, water was injected directly down the casing. Some wells were equipped with tubing and packer set inside the casing.

Producing wells that were converted to intake wells were reshot and thoroughly cleaned out before injecting water.

The oil wells were completed in the same manner as the water intake wells except 4½-in. casing was used throughout. They were equipped with 2-in. tubing, ⅝-in. rods, and 5-hp pumping units driven by electric motors.

### Water Supply

The water supply is obtained from the Tar Springs sand that occurs at a depth of 1000 ft and has a sand section of about 100 ft in the Patoka field. The Tar Springs water is very salty, has approximately 100,000 ppm total solids, and has a total iron content of 12-16 ppm. It has a specific gravity of 1.075, a pH range of 6.8 to 7.1.

Three off-pattern Benoist oil wells were plugged back and recompleted in the Tar Springs as supply wells. The main supply well was equipped with a centrifugal pump set at about 400 ft. This well has a capacity of 7500 bbl per day from a 400-ft setting and a potential capacity of 15,000 bbl, if pumped down. The other two supply wells were equipped with conventional equipment and are used for standby service.

The supply water and the produced water are pumped over slat tray aerators and then collected in settling and storage pits. From the storage pits, the water is pumped into a 500 gpm accelerator or water stabilizer. In the accelerator, the water is treated with about 6 lb of ferric chloride and 20 lb of lime per 1000 bbl. During cold weather, it is necessary to feed activated sodium silicate to obtain proper floculation and settling in the accelerator. After chemical treatment the

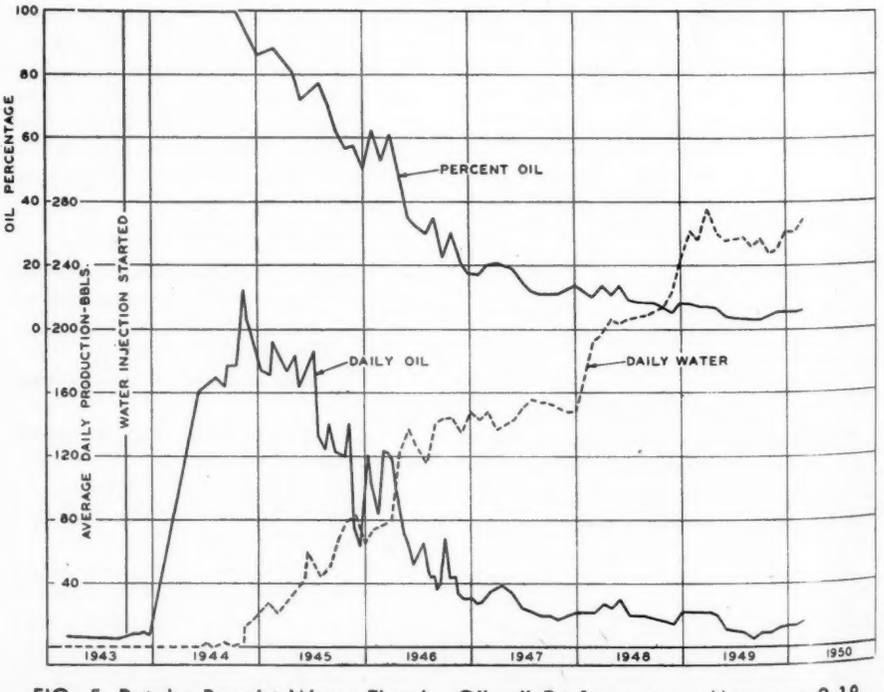
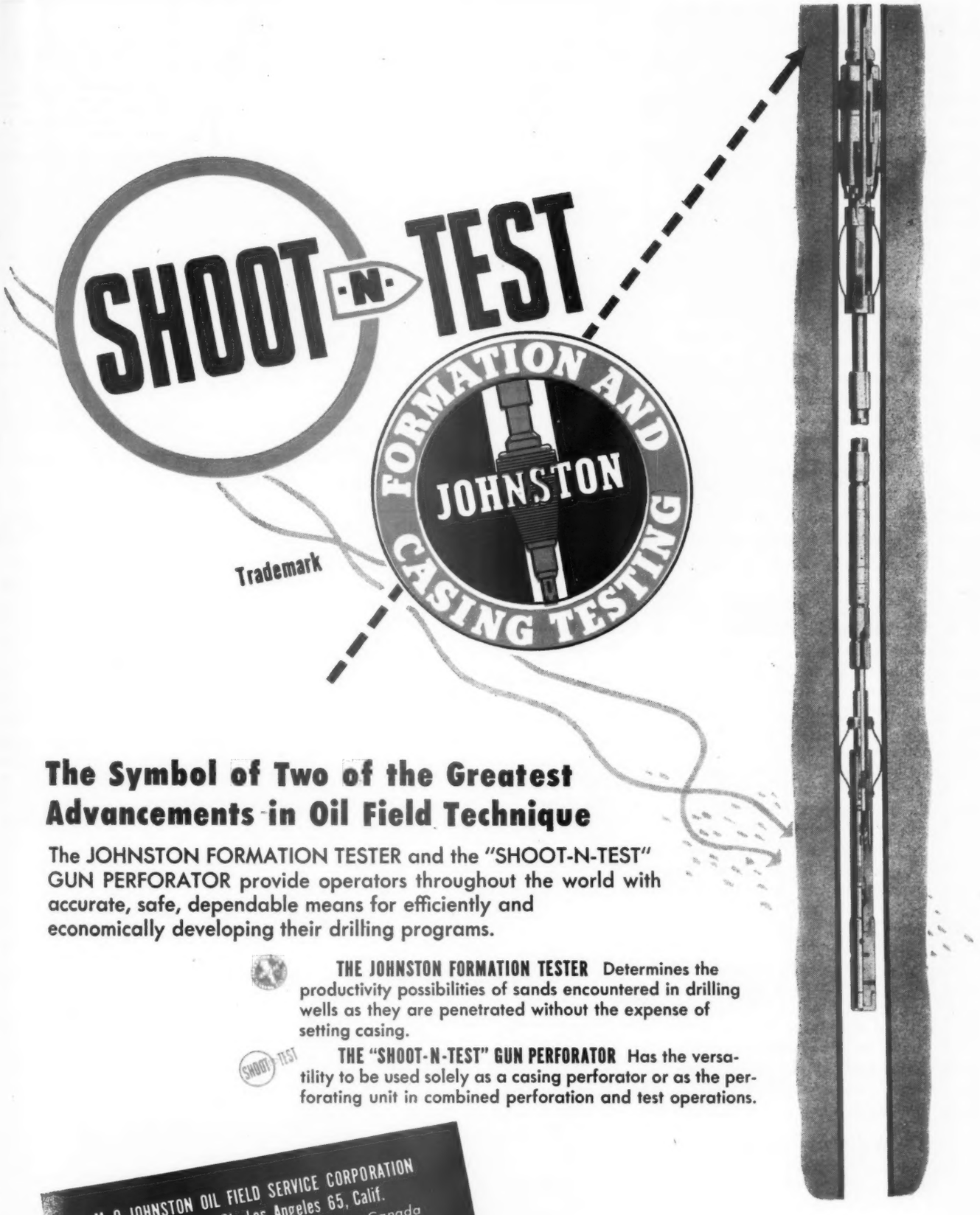



FIG. 5. Patoka Benoist Water Flood—Oilwell Performance—Meryman 0-18.




## The Symbol of Two of the Greatest Advancements in Oil Field Technique

The JOHNSTON FORMATION TESTER and the "SHOOT-N-TEST" GUN PERFORATOR provide operators throughout the world with accurate, safe, dependable means for efficiently and economically developing their drilling programs.

**THE JOHNSTON FORMATION TESTER** Determines the productivity possibilities of sands encountered in drilling wells as they are penetrated without the expense of setting casing.

**THE "SHOOT-N-TEST" GUN PERFORATOR** Has the versatility to be used solely as a casing perforator or as the perforating unit in combined perforation and test operations.

M. O. JOHNSTON OIL FIELD SERVICE CORPORATION
3035 Andrita St., Los Angeles 65, Calif.
Serving California—Rocky Mountains—Canada

M. O. JOHNSTON OIL FIELD EXPORT CORPORATION
EXPORT SALES
3035 Andrita St., Los Angeles 65, Calif., U.S.A.
CABLE ADDRESS "MOJOC"

water flows by gravity through sand and gravel pressure filters.

### Water Distribution

The water at the filter outlet is picked up by centrifugal pumps and distributed to the field. Small single stage centrifugal pumps were installed initially and as the pressure requirements increased, larger centrifugal pumps were added. The present distribution pump is a 4-in. by 3-in. multistage centrifugal pump that has a capacity of 400 gpm against 500 psi and is driven by a 200 hp electric motor.

The distribution system is made up of a 6-in. main line running through the field with 4-in., 3-in., and 2-in. laterals. The major part of the distribution system is of bare pipe except the later extensions which have been cement lined or plastic coated.

### Water Injection

The average characteristics of the injected water are as follows:

| | |
|---|---|
| Methyl orange alkalinity | 50 ppm |
| Calcium carbonate super saturation | 4 – 6 ppm |
| PH | 7.5 – 7.7 |
| Total iron | 0.1 ppm |
| Dissolved oxygen | 4 – 6 ppm |
| Turbidity | Less than .5 ppm |

Most of the wells began taking the desired amount of water on vacuum and later went on pressure. In some of the tighter areas, it has been necessary to set booster pumps to inject the desired amount of water.

Fig. 4 is the water injection curve for Meryman W-18 and it represents about the average intake performance for the flood. This well is one of the pilot flood intakes and it can be seen that the injection rate was stepped up above average in the beginning. The injection curve shows a decreasing rate during 1946 but after acidizing, the rate came up again.

A number of the wells have shown evidence of well bore plugging while others have not. Some of them have been acidized with good results while others have required reshooting. In general, the water intakes have taken the desired amount of water without undue difficulty.

### Oil Well Performance

The oil wells, before water flood, were producing from 2 to 12 bbl of oil per day with a field average of 9 bbl per day. From 5 to 7 months after the start of injection a pattern oil well received its initial kick and the oil production gradually increased to a maximum of about 200 bbl of oil per day.

Fig. 5 is a performance curve for Meryman 0-18. The well is also one of the pilot flood wells and its performance has been about average for the flood. This well reached a maximum oil production slightly above 200 bbl per day and produced all oil for about one year. This well has produced about 160,000 bbl of oil as of March 1, 1950, and its water flood recovery to date has been 400 bbl per acre-foot.

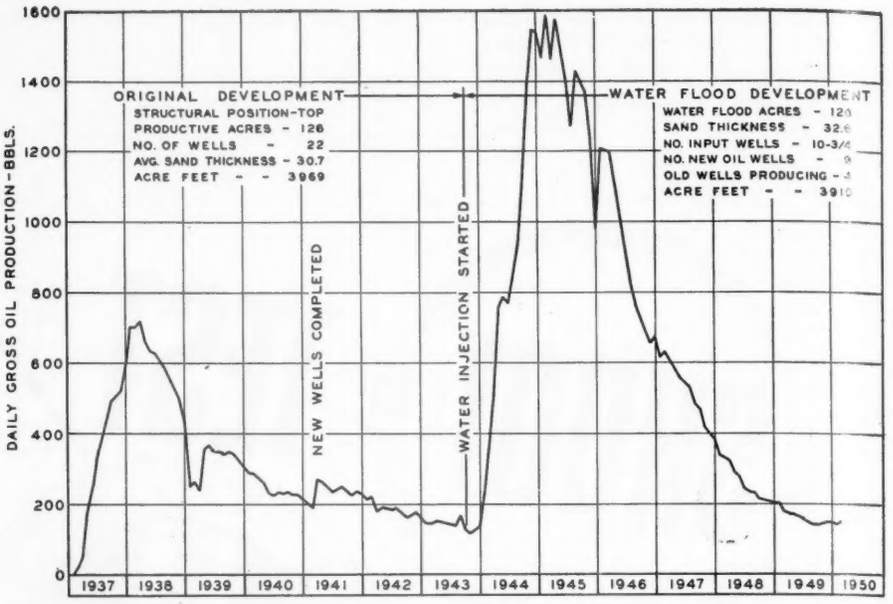



FIG. 6. Patoka Benoist Water Flood—Natural and Water Flood Performance—Meryman Lease

### Meryman and Boyd Leases

The Meryman lease is the largest productive lease in the field and was more completely drilled at the beginning of water flood. Fig. 6 shows the natural and water flood performance of this lease. Under natural production, this lease reached a maximum daily oil production of 720 bbl in March, 1938, and had declined to 140 bbl at the beginning of water injection. The cumulative gross production was 756,400 or 191 bbl per acre foot.

Under water flood, this lease reached a maximum daily oil production of 1600 bbl per day in February, 1945, and is currently producing 150 bbl oil per day. The gross cumulative water flood oil as of March 1, 1950, was 1,472,800 or 377 bbl per acre-ft. The water flood recovery for the Meryman lease is slightly less than the field average.

The Boyd lease is situated on the

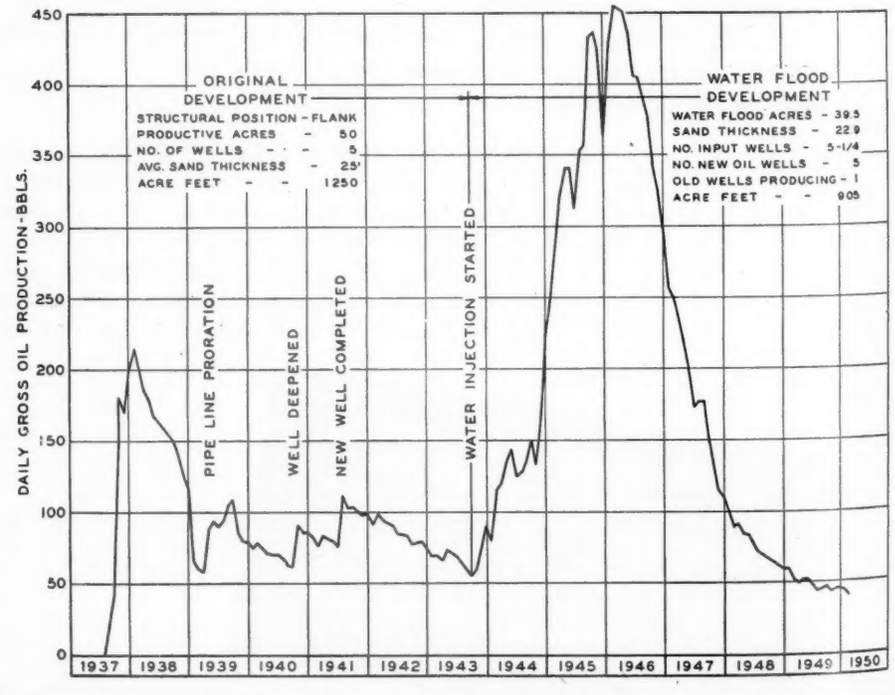



FIG. 7. Patoka Benoist Water Flood—Natural and Water Flood Performance—Boyd Lease

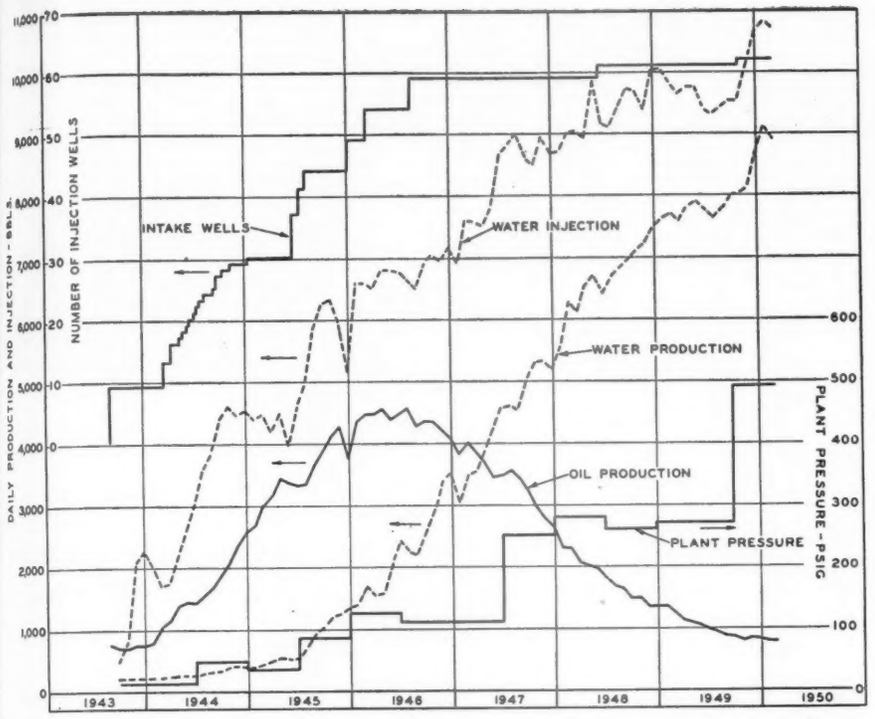



FIG. 8. Patoka Benoist Water Flood—Daily Flood Performance—Total Field.

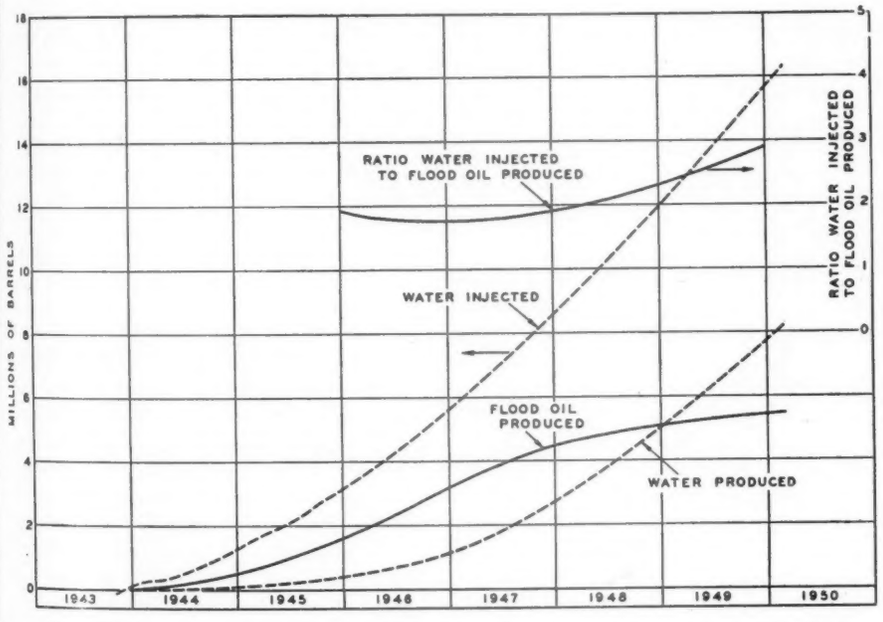



FIG. 9. Patoka Benoist Water Flood—Cumulative Performance—Total Field.

northwest edge of the field and was subject to an ineffective edge water drive from the beginning. It was not developed as completely at the beginning of water flood as the Meryman lease. Fig. 7 shows the natural and water flood performance of this lease. The maximum daily oil production under natural conditions was 215 bbl per day and under water flood was about 450 bbl per day. The cumulative natural oil recovery was 227,402 bbl or 182 bbl per acre-ft. The cumulative water flood recovery as of March 1, 1950, was 440,000 or 489 bbl per acre-ft.

### Performance of Field

The daily flood performance for the total field is shown in Fig. 8. The initial daily injection was 2000 bbl and, with the completion of additional injection wells, the daily injection was increased to a maximum of 10,800 bbl, which is about the current rate.

The daily oil production was about 700 bbl at the beginning of water injection in September, 1943, and it in-

DOES PARAFFIN Clog your well?
USE CRALL SPIRAL PARAFFIN SCRAPERS
(PAT. REG. U. S. PAT. OFF.)

CRALL Spiral Paraffin Scrapers *eliminate* paraffin accumulation at the lowest possible cost. They are designed to fit any sucker rod for 2" or 2½" tubing . . . are NOT welded to rod, but shrink-gripped around the rod.

CHECK THESE FEATURES

- Scrapers alternate — one right, one left — eliminating tendency of rod to unscrew.
- Pass scrapers every pump stroke, up and down. Rod string does not rotate.
- The first low initial cost is the only cost.

Order your CRALL Scrapered Rods from your supply store or wire, write or phone for full descriptive literature.

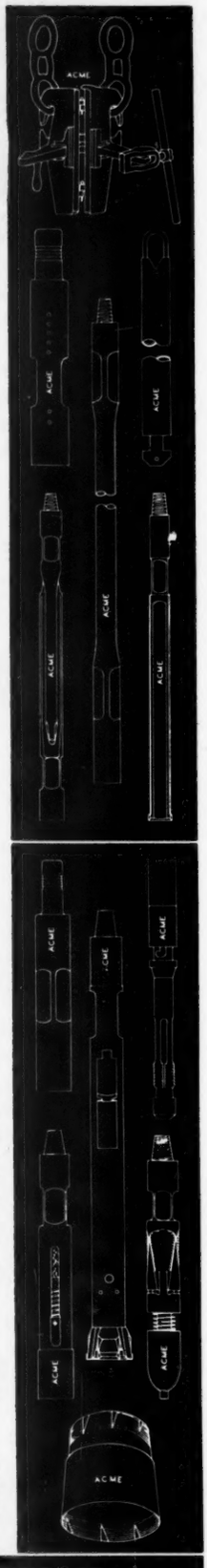
PETROLEUM SPECIALTY CO.
P. O. BOX 1640 PAMPA, TEXAS
Manufacturing and Fabricating Plants at Pampa and Sundown, Texas

50th Acme Anniversary

It just *has to be* a mighty good product . . . whose maker has stuck to it so long. As a world-market leader, Acme still specializes in:

DRILLING and FISHING

TRUSTWORTHY Cable Tools



See Acme's latest condensed Catalog and tool-use Manual in Composite Catalog (up front—in Vol. 1). Or mail penny postal TODAY for your copy. Cover-to-cover full of valuable information for Cable Drillers.

ACME DRILLING & FISHING TOOLS

Since 1900—this familiar symbol has assured more hole-footage per tool dollar.

ACME FISHING TOOL CO.
PARKERSBURG W. VA.
Export Office:
19 Rector St., New York 6, N.Y.

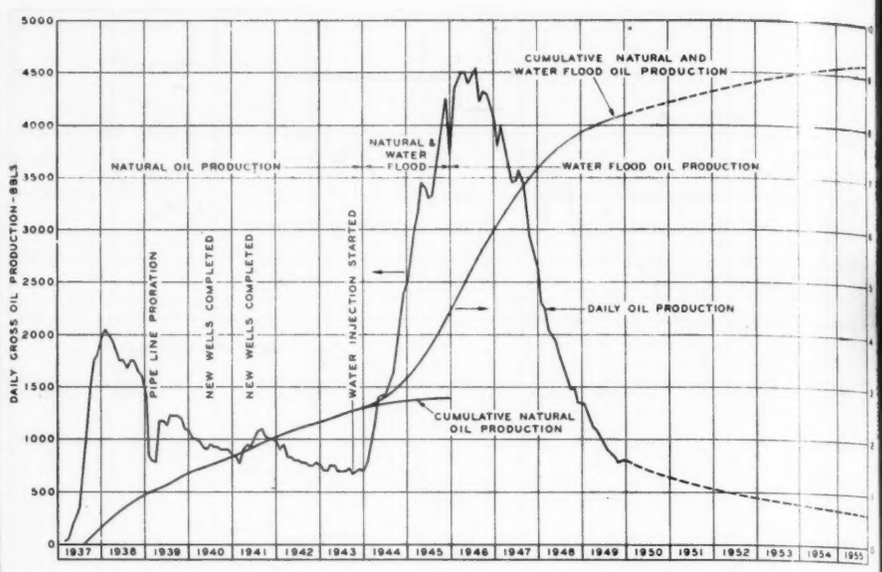




FIG. 10. Patoka Benoist Water Flood—Natural and Water Flood Performance—Total Field.

creased to a maximum of 4560 bbl in July, 1946. The production was maintained at near maximum during 1946 and, since that time, has declined to a current oil production of 800 bbl.

The daily water production was about 200 bbl at the beginning of water injection and has gradually increased until the current water production is about 9000 bbl per day. The initial plant pressure was less than 40 psi, and this has been gradually increased until the present plant pressure is 500 psi.

The cumulative flood performance for the total field as of March 1, 1950, is shown in Fig. 9. The cumulative water injected was 16,300,000 bbl, the cumulative water flood oil produced was 5,451,000 bbl and the cumulative water produced was about 8,200,000 bbl. The cumulative ratio of water injected to flood oil produced was 2.9.

A small amount of water has been lost to outside properties but about an equal amount of water has been produced naturally from a few of the edge wells.

The natural and water flood performance for the total field is shown in Fig. 10. The total field comprised 566 natural productive acres and 80 producing wells. A maximum natural daily oil production of 2050 bbl was reached in January, 1938. By the end of 1944 the daily oil production rate had declined to about 700 bbl and the gross cumulative oil production was 2,608,500 bbl.

It is estimated that, by the time the whole field was under flood, the total natural oil production was 2,800,000 bbl. The average natural oil recovery was 4950 bbl per acre or 193 bbl per acre-ft.

The total water flood area comprises 527 acres and 81 producing wells. The total cumulative oil production, both natural and water flood, was 8,251,000 bbl as of March 1, 1950. The cumulative water flood oil recovery was 5,451,000 bbl, averaging 10,260 bbl per acre or 391 bbl per acre-ft.

It is predicted that the ultimate oil recovery, both natural and water flood, will be 9,200,000 bbl of which 949,000 bbl is yet to be produced. The ultimate recovery will be 17,100 bbl per acre or 650 bbl per acre-ft. The ultimate water flood recovery will be 12,100 bbl per acre or 460 bbl per acre-ft.

### Development and Operating Costs

The total development cost was about $1400 per acre. This comparatively low cost can be attributed to several of the existing conditions, such as good mechanical conditions of wells and equipment, the availability of a cheap water supply, and because a lot of the early development had been completed with the thought of early water injection.

The operating costs at the beginning of flood operations were about $.25 per gross bbl. Under flood, the cost decreased to a low of $.11 per gross bbl and then gradually increased until the current cost is about $.90. The operating costs have been lower than average, because of the exceptionally high unit recovery.

Under the present trend of operating costs, it is estimated that the economic limit will be reached when the production has declined to 300 bbl per day. Plans are being made to convert the wells from pumping to flowing, thereby increasing the economic life. ★ ★ ★

See O-C-T Equipment on display at the Permian Basin Oil Show, October 19-22

# O-C-T C-19 CASING HEADS PROTECT YOUR WELLS FROM OPEN HOLE HAZARDS

● Blowouts happen fast and a profitable drilling operation can change to a blazing financial disaster in a matter of minutes. So don't throw away your blowout protection at the last minute for a matter of hours. O-C-T C-19 Casing Heads eliminate open hole hazards because they provide a positive casing seal and suspension before blowout preventers are removed. When dropped through preventers, suspension and seal are automatically effected. The Hycar packing seal also provides added protection against blowouts from above the top of the cement around the oil string while drilling. Give your well this exclusive O-C-T protection. Ask your O-C-T Representative or write for complete details.

OCT PRODUCTS—dependable and available through more than 700 supply store locations.

*The only Casing Head that meets every well completion problem with a single compact model*

## Oil Center Tool Co.

**P. O. Box 3091, Houston, Texas**

**Export Representatives: Venezuela, Colombia, Peru, and Ecuador —Berry & Hall, Apartado No. 304, Maracaibo, Venezuela Sterling Areas—Le Grand, Sutcliff & Gell, Ltd., Southall, Middlesex, England. Address Export Inquiries for All Other Countries to P. O Box 3091, Houston 1, Texas.**

# Critical Pressures in Oil Well Cementing

*A thought-provoking article on "break-down" pressures, the damage that might occur by use of excessively high pressures, and suggestions for a method of calculating the maximum pressures to be used in squeeze cementing.*

NORMAN C. WELLS*

"GIVE it the works, Bud, you haven't busted anything yet." These might be our words if we were squeezing for a water shut-off on a primary cement job where the state inspector had told us in a polite manner, "It leaks a little, not much, but you better try again." So we try our best. But, "the little man at the bottom of the hole" hasn't been heard from as yet. He is trying to tell us that we have "busted something all to little pieces." What we have done is fracture the oil sand and forced dehydrated mud cake and maybe some cement into the honeycomb of fractures in the vicinity of the hole.

That fracturing can be made to occur by the use of reasonable surface pump pressures, we know, for after all, that is the principle of the Hydrafrac process. Much valuable information has been obtained by Stanolind and Halliburton on the occurrence and nature of formation fracturing. Two schools of thought seem to have developed, although "thought" is not exactly the correct word as much actual information has been uncovered. A preponderance of some of this information leads to the belief that vertical fracturing takes place first. Other evidence indicates only horizontal fracturing along bedding planes. Still other authoritative information discloses staggered fracturing going back and forth between and along bedding planes in zig-zag fashion. The author is of the opinion that a honeycomb of fractures can occur readily, involving fractures in all directions that develop in rapid succession as each crack becomes sealed off with filtered mud or cement. The dehydrating or filtering being done by the sand.

From a study of the information that has been published, it would appear that this honeycomb fracturing could occur prior to the opening of a main fracture that would produce a break in cement pump pressure, or the "break-down" pressure. There is considerable evidence that pressures in the zone of production and approaching the break-down pressure of the zone result very frequently in relatively poor production or even none at all. There is also evidence that these pressures are lower in some zones than the calculated pressure resulting from the weight of the over-burden, even to the extent of requiring caution in controlling the weight of the drilling mud.

### Planning a "Squeeze"

Before considering these not unusual cases, let us first examine the case of a zone that is subjected to normal over-burden pressure. As represented by Fig. 1, we have a well that has been drilled, cased, and cemented in the zone at about 6000 ft. It is desired to shoot and test an intermediate sand for water. To assure isolation of this sand from the sands known to be productive of only oil and gas above and below it, shooting and squeezing are accomplished first. The mud and cement column approximate 0.5 psi per ft, or 3000 psi. The rock pressure is 6000 psi. Therefore, the over-burden will be lifted with 3000 psi surface pump pressure, the calculated break-down pressure, or somewhat less. Fracturing will precede this pressure. Imperfect sealing of the cement to the walls of the oil sands will permit transmission of this pressure, along with cement and mud, to the walls of the oil sands. Fracturing, followed by the filling of these fractures with mud and cement and then their dehydration, may form a barrier impervious to any kind of shooting for production. Surrounded by good producers this well may become a mystery, and incorrect diagnosis may lead to improper field development.

There are other operations that can cause similar results, even by applying pressure from operations other than cementing. Let us first consider another cementing job, however, on a type of completion represented by

EXCLUSIVE

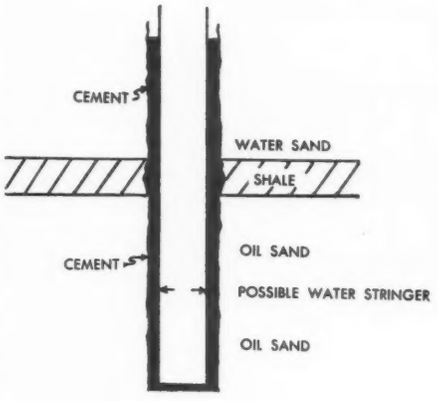



FIG. 1
Squeezing for test.

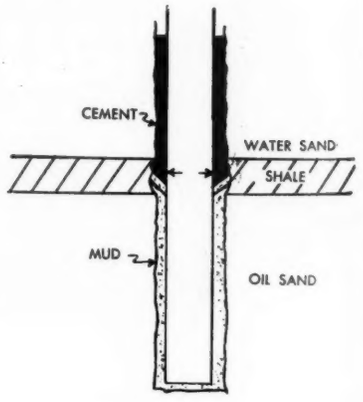



FIG. 2
Squeezing for water shut-off.

*Consultant, Long Beach, California.

Fig. 2. This is a well drilled to the same depth (6000 ft) into an oil sand and cased to bottom, using baskets to cement above the zone. Again, the state inspector likes us so well that he insists on a return visit. So we shoot and squeeze. This time we are going to get a water shut-off "or else," so we squeeze the "daylights" out of it. Pressure, cement, and mud go down to the oil sand and the remaining sequence of events is the same as in the first case.

### A Formula for Safety

So far the comments have offered no solution, but we believe there is a satisfactory one. Using 80 per cent as a safety factor, so as to stay safely under the break-down pressure, we have the following simple formula:

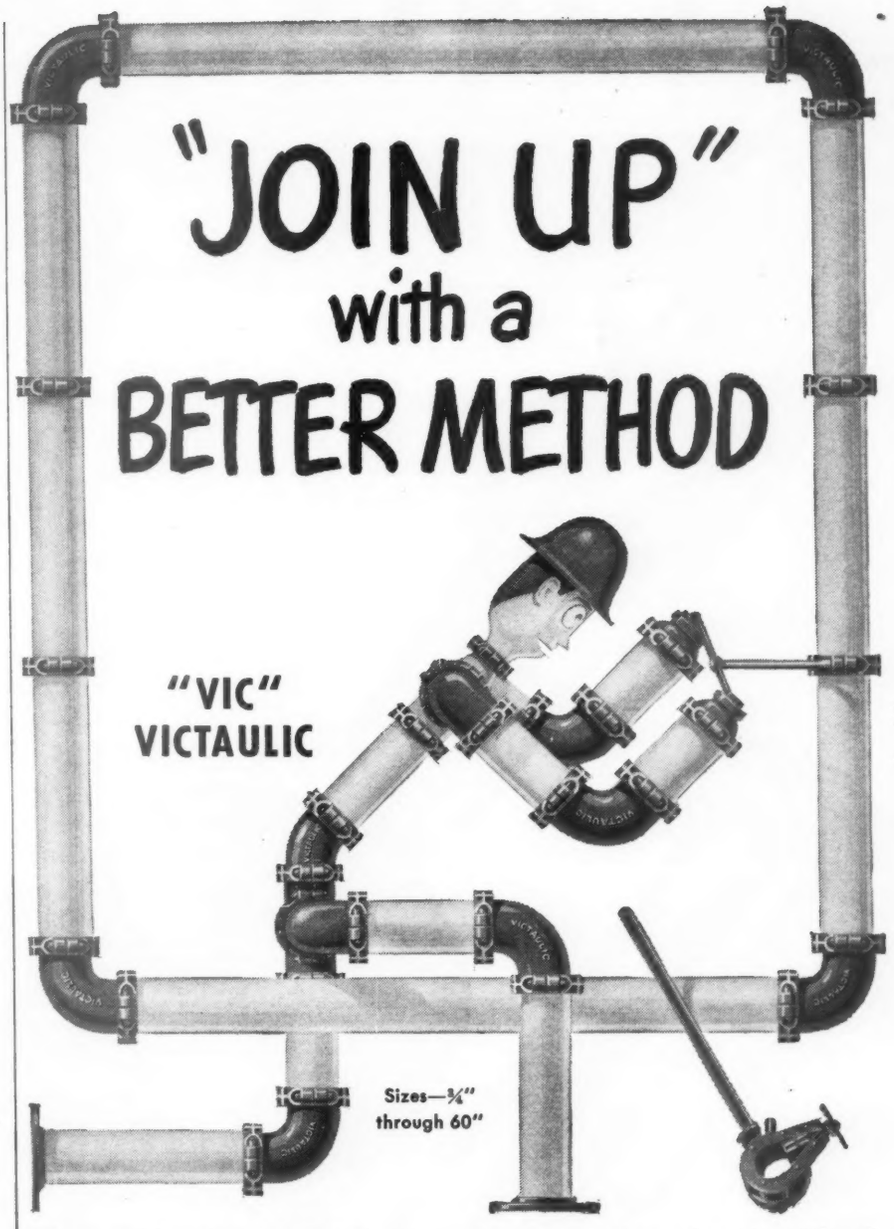
(0.80 × depth) — fluid column wt = Max. pump pressure, or

(0.8 × 6000)—3000 = 1800 psi.

The "squeeze" job might take more than one stage, washing the perforations after each stage, using a slow-setting cement, and waiting 8 hr between stages. In 150 squeeze jobs in one field, the average number of stages was about two. The greatest number was in the case of one well that required five stages. With present day knowledge of mud and cementing procedure, this average could probably have been reduced to a small fraction over one. The important factor is that the pump pressure should never be allowed to exceed the pre-determined upper limit for an instant.

When mud, mud cake, or fluid cement is against the face of the sand, any pressure that is applied by any means should be watched very carefully, and some thought should be given to what might occur and at what point. The danger point might be indicated by a previous determination of the break-down pressure in a given sand. Sands have been found that have even a negative break-down pressure, that is, a column of fluid is sufficient to cause fracturing by itself without any pump pressure.

Lacking any information, how can we determine a safe limit that will still allow us to perform the desired operation? The simple method outlined above may be well and good, however, it involves an arbitrary safety factor. As is usual with simple cases, mother nature does things to confound us, so let us "confound right back" . . . at least to the best of our ability. The lettered figures might be of some help in determining just how cautious we should be until further information develops. The hatched bands indicate caprock structures over oil sands.


The VICTAULIC METHOD of piping can save you time, work, and dollars on construction and maintenance *right down the line.*

When you "join up" with the VICTAULIC METHOD you are assured of easy, quick, and dependable pipe connections. Pipe ends are "hooked up" in a jiffy with Victaulic couplings — only two bolts to tighten with a standard T-wrench! Victaulic pipe joints stay positive-locked, leak-proof . . . they are built to stand up under extreme pressure, vacuum or strain conditions!

Grooving those pipe ends is a cinch with the VICTAULIC METHOD . . . "Vic-Groover" grooves 'em automatically in half the time of a conventional pipe threader!

AND Victaulic offers a complete line of Full-Flow Elbows, Tees, and other Fittings designed for free-flowing efficiency . . . giving complete versatility and dependability to the VICTAULIC METHOD.

"JOIN UP" with the COMPLETE VICTAULIC SYSTEM — a *better method* for efficient piping construction . . . and the EASIEST WAY TO MAKE ENDS MEET. * * *

Make *your* next piping job ALL VICTAULIC. Write today for these two: Victaulic Catalog and Engineering Manual No. 44, "Vic-Groover" Catalog No. VG-47.

**VICTAULIC COMPANY OF AMERICA**
**30 Rockefeller Plaza, New York 20, N. Y.**

Victaulic Inc., 727 W. 7th St., Los Angeles 14, Calif.
Victaulic Company of Canada, Ltd., 200 Bay Street, Toronto 1
For Export outside U.S. & Canada: PIPECO Couplings & Fittings, Pipe Couplings, Inc., 30 Rockefeller Plaza, New York 20, N.Y.

**26TH VICTAULIC YEAR**

Copyright 1950, by Victaulic Co. of America

The easiest way to make ends meet
VICTAULIC
PIPE COUPLINGS AND FITTINGS

# AXELSON
## FIRST CHOICE

Axelson Deep Well Plunger Pumps deliver more oil at less lifting cost with less down-time. There is an Axelson Deep Well Plunger Pump for every specific well condition. For longer pump life, order Axelson service-proved Deep Well Plunger Pumps.

Axelson Duax Pump Liners are duty-designed for extremely difficult corrosive and abrasive conditions. Axelson also produces regular and hardened cast iron Liners for satisfactory service under varying well conditions.

**WRITE FOR BULLETIN** on Sucker Rods and Couplings, Pump Liners, Pump Assemblies, Balls and Seats, specific Deep Well Pump Assemblies, Long Stroke Pumping Units, Pumping Accessories.

AXELSON PETROLEUM PRODUCTION EQUIPMENT

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

# AXELSON PETROLEUM PUMPING EQUIPMENT

*Ask Axelson experts for practical answers*

AXELSON MANUFACTURING CO. • PLANTS — Los Angeles 58; St. Louis 16 • OFFICES — New York City 7; Tulsa 1; Buenos Aires, Argentina; Caracas, Venezuela • DISTRIBUTORS — Jones & Laughlin Supply Co.; Great Northern Tool & Supply Co.; Industrial Agencies, Ltd., San Fernando, Trinidad, B.W.I.; Industrias Waldrip & Campbell, Barcelona and Maracaibo, Venezuela; Dominion Oil Field Supply Co., Ltd., Calgary, Canada.

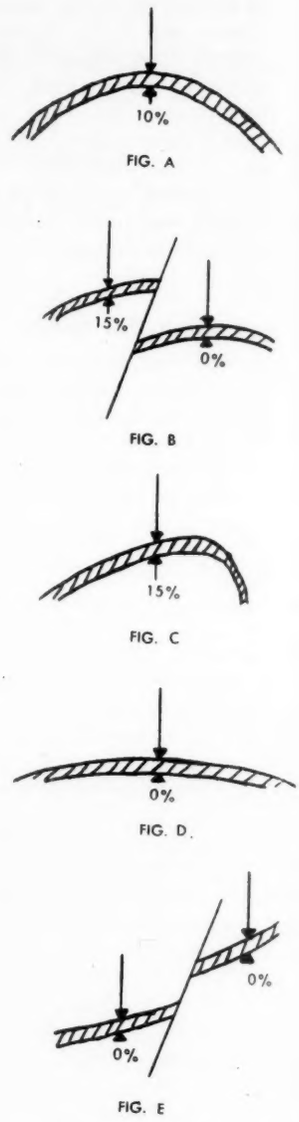




FIG. A

FIG. B

FIG. C

FIG. D

FIG. E

**Possible effect of cumulative caprock support. Per cent of support indicated is only for the purpose of illustration.**

These are shown in very simple form as single structures, whereas each may represent the cumulative effects of a number of structures over the sand. Fig. A represents an anticline with fairly steep dips. Fig. B represents the same with a fault plane through it. Fig. C shows a fold with considerable compaction on the right. Fig. D is a fairly flat anticline. Fig. E is a faulted syncline.

### Structural Factors

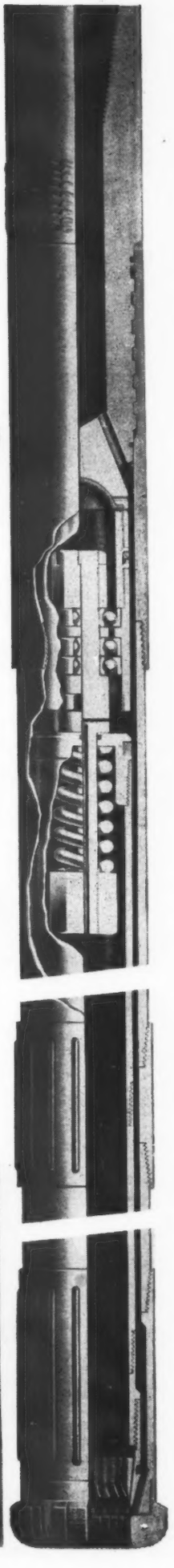
We cannot tell just what safety factor to apply in each case, however, we can generalize about the possibilities and about how cautious to be, so as to play safe. The investment in the

**Designed to meet specific conditions!**
**Selected diamond quality for peak performance!**

**D&S core barrels**
**The model for diamond core barrels**

Barrel Patent No. 2,490,512

ON DISPLAY AT THE
PERMIAN BASIN OIL SHOW,
OCTOBER 19-22, ODESSA, TEXAS



# Diamonds

## *save days and dollars!*





## *Drilling & Service, Inc.*

3031 Elm Street — Dallas 1, Texas

Riverside 6811 • Tremont 7-5559

Distributors for Wheel Trueing Tool Co.

**Diamond bits**
**Rotary shoes**
**Reamers**
**Whipstock bits**
**Core barrels**

Other Offices-Services
Odessa, Texas — 6774
Casper, Wyo. — 3739
Hobbs, N. M. — 1015R
Lindsay, Okla. — 255
Norman, Okla. — 4360
Shreveport, La. — 7-8627
Snyder, Texas — 276J

*Distributors*
Ralph Ruse, 15301 S. Avalon Blvd., Compton, Calif. Telephone: (Los Angeles) MEnlo 45547
Allied Services, Inc., Mt. Pleasant, Michigan Telephone: 29-861

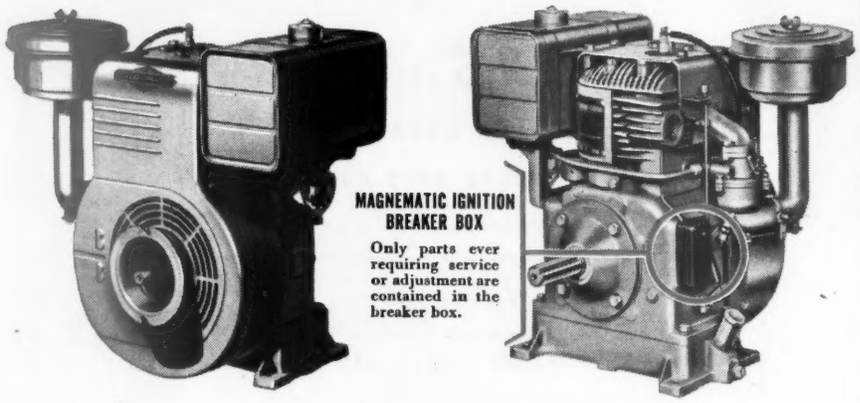
*Foreign*
D. T. O'Connor, 500 Fifth Ave., New York, N. Y.
Petroleum Industry Consultants, C. A., Caracas, Venez.
Denton-Spencer Co., Ltd., Calgary, Alberta, Canada

ONLY BRIGGS & STRATTON
HAS THE MODERN

# Magnematic Ignition

(Patents Pending)

STANDARD EQUIPMENT ON MODELS 9-14-23



MAGNEMATIC IGNITION BREAKER BOX

Only parts ever requiring service or adjustment are contained in the breaker box.

## A Dependable Spark For Better Engine Performance at ALL SPEEDS

**Magnematic Ignition delivers a dependable spark at lower speeds and better engine performance at all speeds.**

**LONG SPARK PLUG LIFE** — magneto output tailored to engine requirements — sparks only on firing stroke — voltage decreases as speed increases, substantially lengthening spark plug life.

**AUTOMATIC SPARK ADVANCE** — spark is retarded at starting speed and automatically advanced as engine speed increases.

**QUICK, EASY STARTING** — pull-up cranking with no danger of a "kick" during rope or hand cranking.

**SEALED, WATERPROOF COIL** — one piece, plastic insulated coil, fully sealed and waterproofed with molded-in high tension lead.

**SIMPLE AND DEPENDABLE** — no extra gears, bearings or lubrication system.

**EASY TO SERVICE** — only parts ever requiring service or adjustment accessible by removing breaker-box cover conveniently mounted outside crankcase.

**Magnematic Ignition is another exclusive Briggs & Stratton development which is setting new standards of performance for single-cylinder, air-cooled engines.**

Write for bulletin giving complete information on Magnematic Ignition and Briggs & Stratton engines.

BRIGGS & STRATTON CORP., Milwaukee 1, Wis., U. S. A.

4 CYCLE BRIGGS & STRATTON GASOLINE ENGINES

Preferred Power FOR INDUSTRIAL CONSTRUCTION RAILROAD AND FARM EQUIPMENT

World Wide FACTORY SUPERVISED SERVICE

**In the automotive field Briggs & Stratton is the recognized leader and world's largest producer of locks, keys and related equipment.**

well, the lease, and the development program may be at stake. In Fig. A, the caprock, having a good arch shape, is presumed to support about 10 per cent of the over-burden weight. In Fig. B, the upthrown arch supports about 15 per cent, while the downthrown arch supports none, so that the rock pressure in the oil sand below is that caused by the full weight of its over-burden. Fig. C shows a caprock that has been arched upwardly by horizontal movement, thus causing it to support an unusually high percentage of the over-burden weight. A low safety factor should be used for calculating fracture pressure below this type of caprock. Fig. D shows a fairly flat structure, allowing a high safety factor. Fig. E also indicates nothing to cause modification of the safety factor to a low value.

Other known or indicated conditions should be utilized to the fullest. In one case, the break-down pressure in an oil sand at 10,000 ft below a structural arrangement represented by Fig. C with 0.50 psi per ft fluid was 3100 psi. This would determine a safety factor, X, as follows:

$$(X \times 10{,}000) - 5000 = 3100$$

$$X = 0.81, \text{ or } 81 \text{ per cent.}$$

A safety factor of about 75 per cent should be used, however, so as to prevent small fractures near the wall of the hole. The maximum pump pressure would then be:

$$(0.75 \times 10{,}000) - 5000 \text{ or } 2500 \text{ psi}$$

### Use of Judgment

Admittedly, this article has failed to give us exact answers to the problems discussed. The use of good judgment in each actual case along the lines discussed, however, might be of some help. We are working at least in a reasonable range. The fictional 15 per cent indicated in Fig. C was 19 per cent in the actual case cited above. We may have cases where the factor of safety would be as low as 50 per cent. It is reasonable to believe, however, that these cases would occur at relatively shallow depths.

Cementing a water string in a hole bottomed in the shale above an oil sand presents none of these problems, unless there are sands above that might produce oil or gas in the future. Any application of artificial pressure on a well will have its effect, plus the weight of the column of fluid, at the bottom of the hole. This we know, however, we think too often only of the resultant effect on the casing. Some day the "little man down there" will increase his vocabulary, and we will know more. In the meantime, we can play reasonably safe. * * *

LANE WELLS

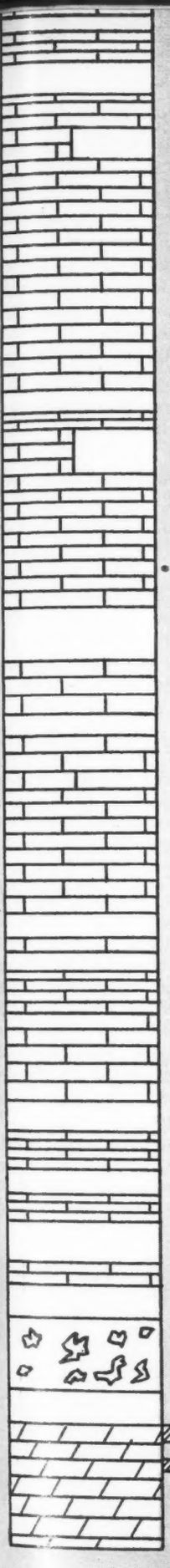
TECHNICAL OIL FIELD SERVICES

# Radioactivity Well Logging

## SAID "HERE!"

Pinpoint accuracy was a "must" in this Kansas well, because the lower porous zone in the Arbuckle dolomite is known to contain only water. A Lane-Wells Radioactivity Well Log clearly defined the formations, picked out the three porous zones, and, through the log of casing collars, provided a perfect system of depth markers. Completion based on the log brought in the well with IP of 1341 BOPD.

This is one example out of many thousand which could be mentioned to show how experienced well operators employ Lane-Wells Radioactivity Well Logging. Because it gives them a complete, accurate "road-map" of the formations traversed; because the collar log gives reliable depth measurements; because porous and fluid-bearing zones are well marked, Lane-Wells Radioactivity Well Logging means better completions, less squeezing, more accurate control of gas/oil ratios—in short, better wells at lower cost.



*Ask Your Lane-Wells Man*

AR-309

LOS ANGELES • HOUSTON • OKLAHOMA CITY

General Offices, Export Office and Plant • 5610 SO. SOTO STREET, LOS ANGELES 58, CALIFORNIA

LANE-WELLS CANADIAN CO. IN CANADA • PETRO-TECH SERVICE CO. IN VENEZUELA

# NEWS

## Fuller Speaks in Canada

The Oilfield Technical Society of Calgary and Alberta, Canada held its regular monthly meeting recently at the Al-San Club in Calgary. Speaker of the evening was John Fuller, manager of Production Equipment Sales, Oilwell Supply Company, Dallas, Texas. His paper was entitled "On the Beam Pumping" and covered the various aspects and problems associated with pumping oil wells. The paper was illustrated with slides and one film. The meeting was then open for questions and discussion.

## Illinois, Indiana in 1949

The Illinois State Geological Survey has published a reprint titled "Developments in Illinois and Indiana in 1949," by A. H. Bell and R. E. Esarey. The article, reprinted from the AAPG Bulletin, may be obtained by writing Illinois State Geological Survey, Urbana, Illinois.

## Drilling Company Formed

John Lindas, president of the John Lindas Oil, Inc., announces the formation of the Carter Drilling Company with John Lindas, Nick Carter, and H. C. Turner, as partners. The new company will have cable tools for the purpose of drilling in after rotary tools and drilling wells from top to bottom. Carter will be the general manager of the new company as well as the director of materials for the John Lindas Oil, Inc., and will also serve in other capacities. The offices of the new company will be at 1316 Union National Bank Building, Wichita, Kansas, in the present offices of the John Lindas Oil, Inc.

Nick Carter

Carter resigned his position as district manager of the Mid-Continent Supply Company as of September 1, 1950. He has been with Mid-Continent Supply for nearly six years and prior to that time had a wide range of experience in the oil business and the oil field supply business in Texas, Oklahoma, Louisiana, Arkansas, Kansas, and Nebraska.

## Study Carthage Field

A Bureau of Mines petroleum-engineering study on the extensive Carthage gas field in Panola County, Texas, has been released by the United States Department of the Interior. Considered the fourth largest natural gas reserve in the United States, the Carthage field was developed rapidly during the war, increasing from 19 producing wells in March, 1944, to 306 producing wells on July 1, 1948. The original gas reserves of the Carthage reservoirs are estimated at 7.604 trillion cubic feet.

The Bureau survey includes descriptions of the geology of the field and producing reservoirs, drilling and development of the field, gathering systems and pipeline outlets, natural-gasoline plants, and estimates of gas reserves. Tables and illustrations also are presented in the report, which was prepared by C. J. Wilhelm, principal petroleum engineer; H. M. Harris, associate petroleum engineer, and M. N. Harlin, former petroleum engineer (deceased), of the Bureau's Petroleum Experiment Station, Bartlesville, Oklahoma. A free copy of the publication, Report of Investigations 4698, "Petroleum-Engineering Study of the Carthage Gas Field, Panola County, Texas," may be obtained from the Bureau of Mines.

**AAODC Meets in Austin.** Members of the American Association of Oilwell Drilling Contractors meeting in Austin, Texas, recently made tentative plans for a series of conferences on personnel problems in collaboration with the University of Texas. Attending the conferences are: Seated, Pete Dublin, Donnell Drilling, and Mickey Bell, W. H. Black Drilling, Midland; Charles Cyrus, The University of Texas; M. L. Powers, Oklahoma A. & M. College; A. Q. Sartain, Southern Methodist University; Forrest Smith, Carl B. King Drilling, Midland; Luther Bailey, University of Texas. Standing: Jim Conway, University of Texas; Harry Halsell, M. J. Delaney Company, Odessa; R. L. Dailey, John Woodruff, Gordon Oliver, Vernon Bruce, and Jack Wiggins, all of the University of Texas petroleum extension training staff; A. L. Franzolino, Southern Methodist University; G. W. Hutcheson, George P. Livermore, Inc., Lubbock; John Carpenter, Kerr-McGee Oil Industries, Oklahoma City; Jim Brown, Westlund Drilling, Midland; Burt Risley, University of Texas; Harry Woodward, Thompson-Carr, Inc., Houston; and W. H. Herndon, Western Company, Midland.

Others in attendance but not in the photograph include George P. Livermore, George P. Livermore, Inc., Lubbock; Claude Pipes, Texas Employers Insurance Association, Dallas; J. Doyle Settle, American Association of Oilwell Drilling Contractors, Dallas; and Earl Bowler, The University of Texas.

Ron. B. Shearn

## British Lecturer Here

Ron. B. Shearn, lecturer in petroleum production engineering, Birmingham University, England, was a recent visitor to the United States. During his stay he visited Gulf Coast fields of Louisiana and Texas, the Wichita Falls area, Texas, and the production research departments of major oil companies.

## Gruy To Be Consultant

H. J. Gruy has announced the opening of consulting offices in the McKeever Building at 2509 West Berry Street, Fort Worth, Texas. Gruy has been associated with the firm of DeGolyer and MacNaughton, petroleum consultants in Dallas, Texas. During his association with that firm, from 1945 to the present time, Gruy prepared evaluations and appraisals and worked in most of the producing areas of the United States as well as Venezuela and Alaska.

Before joining DeGolyer and MacNaughton he was employed by Shell Oil Company for eight years and Standard Oil Company of Texas for one year.

A graduate of Texas A. and M. College, he is now president of the Petroleum Engineers Club of Dallas and is a member of the Dallas Geological Society, the American Association of Petroleum Geologists, the American Institute of Mining and Metallurgical Engineers, the Engineers Club of Dallas, Tau Beta Pi, and is a registered professional engineer.

In addition to appraisals of producing properties and drilling prospects, he will specialize in management service ranging from periodical inspection of properties, recommendation on producing methods and additional drilling, to actual field supervision and management.

## Cities Service Moves

Cities Service Oil Company (Pennsylvania) has moved its offices from 1440 Mellie Esperson Building, Houston, Texas to Fort Worth, Texas. The Fort Worth address will be 1008 Neil P. Anderson Building.

OTIS Surface SAFETY VALVE

Pressure fluctuation will *instantly* cause the Type X Otis Surface Safety Valves to shut off the flow in these high-pressure wells. Without this automatic protection, public property and people living in nearby houses would be in constant danger if surface fittings should fail and cause the well to flow uncontrolled. Valuable production worth many times the cost of the Otis Safety Valve would be irrecoverably lost if a break occurred in a line located in an isolated area and the well flowed uncontrolled. This full-opening Type X Valve is available in several models: With high- and/or low-pressure pilots . . . valves operated by external or internal pressure . . . for test pressures up to 15,000 p.s.i. . . . and valves that can be installed upstream and operated by downstream pressure. Contact one of these Otis field offices for complete details and technical literature:

Houston • Corpus Christi • Victoria • Odessa
Longview • Falfurrias • Oklahoma City
New Iberia • Houma • Brookhaven

OTIS PRESSURE CONTROL, INC.

OTIS — PRESSURE CONTROL — SERVICE — EQUIPMENT

BOX 7206
TWX DL-220
LD 131
DALLAS

OTIS
TYPE A
SURFACE SAFETY VALVE

another NEW OTIS pressure control
now being field-tested . . . to be announced soon

# WHAT'S DOING IN DRILLING

## Socony Gets Canadian Well

The Socony-Vacuum Oil Company, Inc., has completed its first successful well in Canada, its No. 1 Flint. Situated 50 miles southeast of Edmonton in Alberta province, and 42 miles southeast of the Leduc-Woodbend field, the well taps 29 ft of oil-bearing Devonian limestone at a depth of 4507 ft in the D-2 zone. Successive drillstem tests with a half-inch choke on separate portions of the 29-foot pay section showed estimated daily rates of 700 bbl, 200 bbl, and 575 bbl. The oil is sweet and with 33.8 gravity and a 500-to-one gas-oil ratio.

## Drills Lincoln Producer

Sinclair Oil and Gas Company has completed a new producer in Lincoln County, Oklahoma. It is the No. 4 Broeker, which flowed 110 bbl of 40.6 gravity oil in 7 hr through a 42/64-in. choke on tubing from the Prue sand. With the oil was 648,000 cu ft of gas a day. It was drilled to a total depth of 3523 ft. Casing pressure was 340 lb and tubing pressure 140 lb.

## Hugoton Field Nears Half-Way Development

The Conservation Division of the Kansas State Corporation Commission has reported that the huge Hugoton gas field in southwest Kansas neared its halfway development mark in August. The field is purportedly the largest contiguous sweet gas reservoir in the world. Saturation point in the 2¼ million acre area is estimated in the vicinity of 4000 wells with one-to-the-section spacing. Dominated by Hugoton, Kansas' gas production is over 45 billion cubic feet ahead of 1949, and at the present pace, close to 350,000,000,000 cu ft will be produced in 1950.

## Complete Edmonton Well

The California Standard Company's Acheson No. 1 wildcat discovery, 8 miles west of Edmonton, Canada is being completed at 5090 ft, after opening 121 ft of above-water D3 reef. During tests the Acheson well gave flows up to 1500 bbl a day.

## Begin Water Flooding

The Salem Unit of The Texas Company has assumed operation of the Lake Centralia, Illinois oil pool. This is being done as a result of a program designed to recover about 206,000,000 bbl of oil from the field by water flooding. The program will be the largest attempt at oil recovery by water flooding in the history of the industry, Richard W. Love, unit superintendent, said.

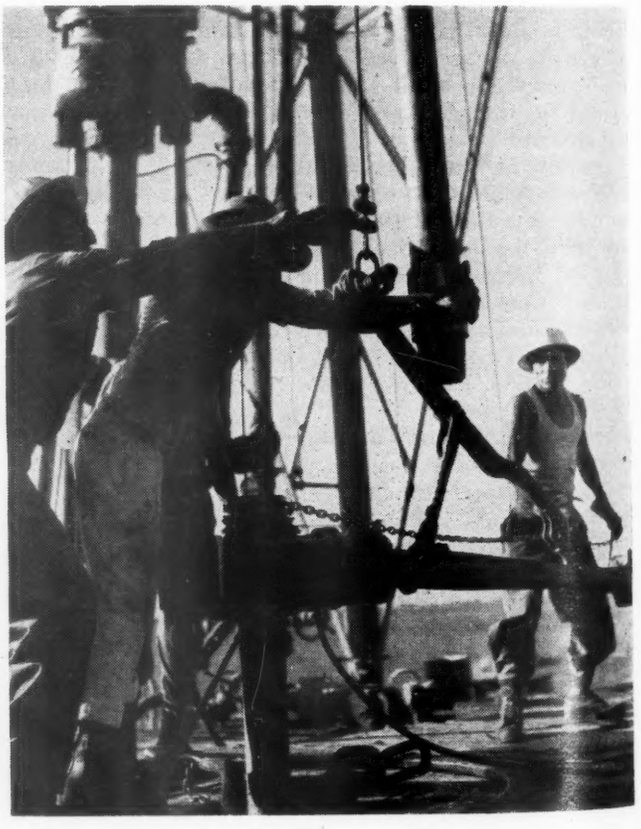
Lake Centralia pool covers more than 10,000 acres and contains about 2400 more wells.

## New Panther Creek Producer

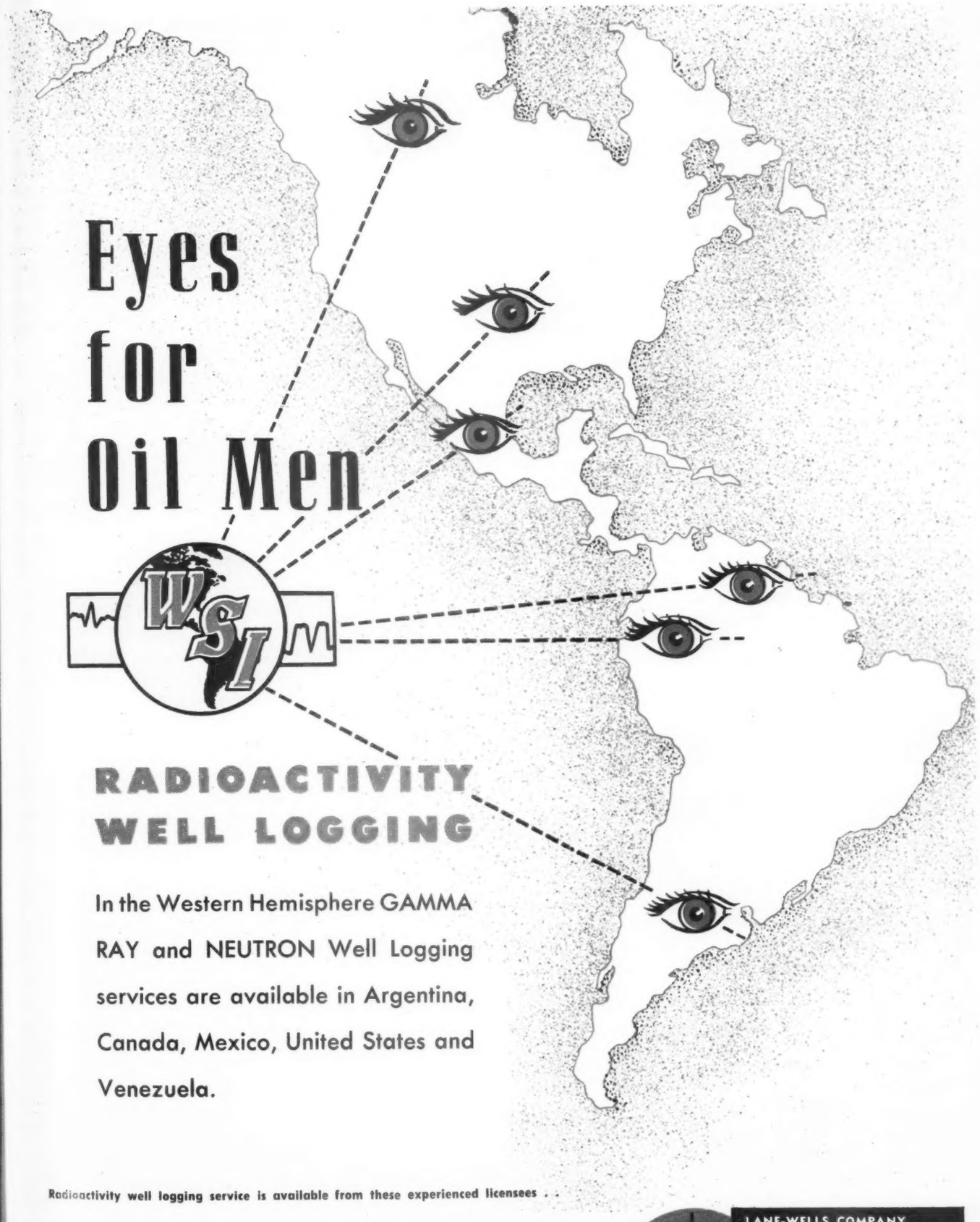
A new Panther Creek producer has been proved in the Garvin County, Oklahoma pool. It is Carter Oil Company's No. 1 Viersen, which ran drillstem test with packer at 7606 ft. open one hour, gas in three minutes, and small amount of distillate in 27 min. Operator recovered 120 ft of 59.8 corrected distillate. Bottom hole flow pressure was 1800 lb and bottom hole shut-in pressure was 2850 lb in 25 min.

Drilling operation at a Socony Vacuum well situated in the Guico district, Venezuela.

Pulling pipe out of hole.



Pulling casing out of hole.



# Eyes for Oil Men

## RADIOACTIVITY WELL LOGGING

In the Western Hemisphere GAMMA RAY and NEUTRON Well Logging services are available in Argentina, Canada, Mexico, United States and Venezuela.

Radioactivity well logging service is available from these experienced licensees . .

**Well Surveys, Inc.**

TULSA, OKLAHOMA U.S.A.

LANE-WELLS COMPANY
UNITED STATES & CANADA

SEISMOGRAPH SERVICE CORP.
of Delaware
MEXICO

GEOTECNICA, S. A.
BUENOS AIRES, ARGENTINA

PETRO-TECH SERVICE CO.
CARACAS, VENEZUELA

## Steel Shortage May Curtail Drilling

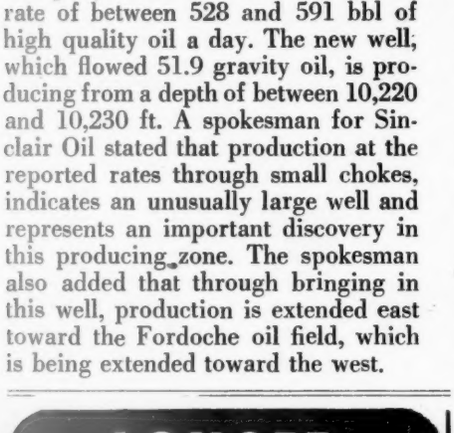
An Independent Petroleum Association of America survey has revealed that steel shortages may curtail drilling of oil wells this year. Procurement of oil field pipe is growing more difficult with supplies tight and deliveries delayed, a materials committee of the association, reported. The committee's report was based on answers to a questionnaire sent to oil and gas producers in 10 states.

## Finds New Producing Zone

A new producing formation in the Lottie oil field, Point Coupee Parish, Louisiana has been located by Sinclair Oil and Gas Company and The Texas Company. Their No. 3 flowed at the rate of between 528 and 591 bbl of high quality oil a day. The new well, which flowed 51.9 gravity oil, is producing from a depth of between 10,220 and 10,230 ft. A spokesman for Sinclair Oil stated that production at the reported rates through small chokes, indicates an unusually large well and represents an important discovery in this producing zone. The spokesman also added that through bringing in this well, production is extended east toward the Fordoche oil field, which is being extended toward the west.


LONGER THREAD LIFE WITH Jimmie Gray COMPOUNDS

MONEY BACK GUARANTEE




EXCLUSIVE 500-TON SPECIAL

LONG-LIFE DRILL COLLAR COMPOUND

THREE famous compounds—each engineered to do certain jobs best! Used by drillers everywhere for real thread protection against galling and washouts. And they know that you can always break the joint when you use Jimmie Gray Compounds!

SOLD AT SUPPLY STORES EVERYWHERE

PETROLEUM DISTRIBUTING CO.
BOX 203—HOUSTON, TEXAS
CHarter 5648


## Tulsa County, Oklahoma, Has New Oil Pool

A well estimated at between 70 and 80 bbl of oil a day with 2,500,000 cu ft of gas has been brought in on the Katy railroad right of way in Tulsa County, Oklahoma. It is Frank G. Herscel's No. 1 Katy Right of Way, which topped the Burgess sand at about 1380 ft and immediately began flowing oil through 5-in. casing.

## New Bishop Well in Cuyama

Bishop Oil Company has announced that Bishop-Hancock well 44-31 in the Cuyama area of California pumped at a rate of 510 bbl per day on an 8-hour test this morning. Theoretical capacity of the pump is 343 bbl per day, indicating considerable flow from the well. The well is situated two and a half miles from nearest production and is a major oil discovery in the state of California.

## Pennsylvania Zone Extended

Pennsylvanian production has been extended a mile and a half to the northeast by Amerada Petroleum at its No. 1-S State-A in Lea County, New Mexico. On drillstem test of the sand at 9961-85 ft, it tanked 128.78 bbl of oil, 2 bbl of mud, and 5.8 bbl of drilling water in 4 hr. Gas was estimated at 1,000,000 ft a day.

## Colon Venezuelan Output

The Colon Development Company, Ltd., has reported that it produced 356,985 bbl of crude oil during the 4 weeks ending August 28, in Venezuela. Colon produced 348,593 bbl of crude oil in Venezuela during the 4 weeks ending July 31, 1950.

## July Production Up

Anglo-Iranian Oil Company has reported that its production of crude oil in Iran for the month of July amounted to 2,801,000 long tons. This compares with 2,694,000 long tons produced in June by Anglo-Iranian. Total production for the period of January 31 to July 31 amounted to 18,493,000 long tons.

## Improve Benefit Program

An improvement plan for its employee benefit program has been announced by the General Petroleum Corporation, Los Angeles. Principal changes in the existing plan, concern disability benefits, vested rights of employees in company contributions, and early retirement rights. The new provisions have been made available on an immediate basis to unorganized employees, and are being offered to the bargaining agents of the 13 organized employee groups.

## Wood County Pool Widened

Production in the Forrest Hills sub-Clarksville sand pool of Wood County, Texas has been extended both to the east and to the west. Cities Service Oil Company has completed its No. 1 Reeves, for the first east-extension as a small producer to pump 17.88 bbl of 16.8 gravity oil daily through perforations from 4454 to 4462 ft and 4469 to 4484 ft. West extension has been drilled by the Edson Petroleum Company and Ray Holbert, who have completed their No. 1 Matheson to pump 132 bbl of 17.4 gravity oil daily through 128 casing perforations from 4486 to 4502 ft.

## Lone Prairie Zone Found

A new and shallower producing zone has been discovered by W. H. Bryant at his No. 1 C. C. Lacey in the Lone Prairie field in Montague County, Texas. The well was completed for 68 bbl daily from perforations at 4865-73 in what is believed to be Strawn sand. This well, drilled to 6143 ft, failed to develop conglomerate production and was plugged back.

## Shell Finds New Zone In South Louisiana

The Turtle Bayou field of Terrebonne Parish, South Louisiana has been extended with the completion of Shell Oil Company's No. 3 Continental Land and Fur Company. Flowing through 12/64-in. choke, the well showed a completion gage of 325 bbl of oil and 1,516,000 cu ft of gas per day. Tubing pressure was 2950 lb with gas-oil ratio of 4356 to 1. Oil was 33 deg gravity. Although completion was made from casing perforations placed at 6514-34 ft, the hole was drilled to total depth of 12,758 ft and has 8 5/8-in. casing cemented at 11,375 ft. The well extends production one and one-half miles to the northeast.

## Deepest in Mississippi

Drilling at the No. 1 Tung Oil Corporation in Stone County, Mississippi has gone below the 18,270-ft mark, with no commercial showings so far. George Vasen, wildcatter, said the crew was coring in side-tracked hole below 18,270 ft.

## Deeper Zone Found

Gulf Oil Corporation's No. 10 Miller has opened deeper producing zone in the old Maud pool of Pottawatomie County, Oklahoma. At a depth of 4343 ft, plugged back from 4357 ft, it perforated casing between 4328-38 ft and was given hydrafrac treatment. It then swabbed 426 bbl of oil in 16 hr, 271 bbl of which is new oil. Latest gage was 255 bbl of oil in 19 hr.

# EXPLORATION ACTIVITIES

## Union of California Finds 92-Ft Oil Sand, Texas

Union Oil Company of California has brought in a new discovery well in Terry County, West Texas, with completion of its No. 1 Laura. On initial tests an oil-bearing Pennsylvania formation 92 ft thick was found, at the well situated about 4 miles southeast of Brownfield.

On one test at a depth of between 9910 and 9970 ft, the well flowed an estimated 10 to 15 bbl of good quality oil an hour. On another test between 9991 and 10,002 ft the well flowed an estimated 82 bbl of oil an hour for 50 min.

## Find New Zone, Milroy Pool

A new producing zone has been opened up in the Milroy pool of Stephens County, Texas by The Texas Company at its No. 2 Harley. The zone opener flowed 322 bbl of oil in 12 hr from the Pennsylvanian sand, topped at 1770 ft. From a plugged back depth of 2168 ft, the well flowed 215 bbl of oil the first 6 hr through casing, and the last 6 hr flowed 107 bbl of oil through ½-in. choke. Operator is perforating 7-in. casing from 1773-93 ft with 4 shots and 44 regular bullets.

## Rank Wildcat Opens Colorado Oil Pool

An oil pool in rank wildcat area of Colorado has been opened by Shell Oil Company, about 20 miles northeast of nearest production in the old Greasewood pool. Shell No. 1 Hanson topped the Muddy sand at 6714 ft and on the drillstem test between 6715-26 ft, with tool open 2 hr, had gas in 5 min, and 4400 ft of 38 gravity oil in the hole. The flow lasted 3 min and the amount of oil flowed from the tool was roughly 30 bbl.

## New Kansas Production

New production has been proved 16 miles northeast of the Davis Ranch field in Wabaunsee County, Kansas. Skelly Oil Company has reported recovery of 910 ft of clean, 27 gravity oil on a drillstem test at its No. 1 Fearon. Recovery was made in a 110-min test at 2910-40 ft in the Viola, topped at 2901 ft. Earlier, before drilling on to the Viola, operators recovered 15 ft of 21 gravity oil and 110 ft of mud and salt water in the Hunton formation, topped at 2575 ft.

## Carter Finds New Oil Area

Carter Oil Company has discovered a new oil area in North Louisiana, Concordia Parish with completion of its No. 1 Clyde Graham, 13 miles south of Feriday. Estimated production is 300 bbl of 44 gravity oil daily on a ¼-in. choke from the Wilcox sand at 5976 to 5982 ft. Drilled to a total depth of 6170 ft, the well has casing set at 6058 ft. Nearest Wilcox production is 8 miles southeast in the Glen Aubin field of Mississippi.

## Venezuela to Step Up Search for Oil

Venezuela plans to step up its search for crude oil production to supply American and European consumers during any major emergency according to Winthrop Rockefeller, of Socony-Vacuum Oil Company, who is in Venezuela to supervise the company's exploitation plans. Rockefeller stated that world consumption of crude oil and its derivatives has risen sharply due to domestic and industrial uses in the U. S., Europe, and some Latin American countries. He predicted that demand for and sales of Venezuelan oil would again reach unprecedented figures.

## Year's 98th Pool Discovered in Kansas

Kansas' 98th pool opener for the year has been completed by Heathman Drilling Company in Graham County. The company's No. 1 Raymond "A" was given a 124-bbl-daily potential on pump test at 3705-8 ft in Arbuckle. It opens the Morlan southeast pool, a mile southeast of Morlan field production.

## Alberta Strike Made

Gulf Canadian Oil Company, a subsidiary of Gulf Oil Corporation, has discovered a new oil and gas pool in the province of Alberta, western Canada. It is Gulf's No. 1 Big Valley which hit the D-2 (Devonian pay) at 5240 ft. On drillstem test between 5237-52 ft, with tool open 35 min, gas, which was estimated at 1,500,000 cu ft a day showed in 4 min, mud in 13 min, and oil in 15 min. The well flowed oil at a rate of 100 bbl an hour. Recovery was 5252 ft of 31.4 gravity oil. The discovery is in rank wildcat territory about 18 miles south of the Stettler pool discovered a couple of years ago.

## First Commercial Oil Found in Alfalfa, Oklahoma

Smiley-Little-Myers Drilling Company, Cecil Davis, et al have found the first commercial oil production in Alfalfa County, Oklahoma at its No. 1 Glidewell. At total depth of 5876 ft. with 7-in casing set at 5852 ft, the Oswego lime, a new oil horizon for the area, was treated with 3000 gal of acid and had a show of gas. The well was deepened to 5935 ft and treated with 6000 gal of acid. It then tested from 30 to 50 bbl of oil a day.

Reacidized with 10,000 gal, the well is flowing by heads, making a 20-min flow each hour for an output of from 40 to 75 bbl of oil a day.

## Western Transfers Offices To Shreveport, Louisiana

Headquarters of the eastern division of Western Geophysical Company of America have been transferred from Natches, Mississippi, to Shreveport, Louisiana, according to an announcement by Henry Salvatori, president. The eastern division remains under the direction of Booth B.

Booth B. Strange

Strange, vice president, who first joined Western Geophysical Company as a computer in Texas in 1936.

Strange was party chief for two years in the San Joaquin Valley, California operations, after which he held a similar position on a geophysical crew that conducted extensive surveys in Texas, Mississippi, and Alabama. In 1942 he was appointed supervisor in charge of the entire eastern division, and has since been responsible for the direction of widespread seismograph and gravity operations in the Mid-Continent, Gulf Coast, and eastern states. He is a graduate of University of Oklahoma with a BS in engineering in 1936.

## New Society Formed

The Houston Geological Society has been approved by the board of directors as the fourth affiliate of the American Geological Institute. The Houston Society has been actively engaged in the program set forth by the Institute.

## New Canadian Area

A new area has been opened in Saskatchewan, Canada by Albercan Heart's Hill No. 1. Drilled by Albercan Oil Corporation, the well flowed heavy crude of undetermined gravity, and is situated 20 miles northwest of Kerobert in west central Saskatchewan. Albercan is a subsidiary of Pancoastal Oil Company, C. A. of Venezuela.

## Bring in Shackelford Well

Discovered some 846 ft southeast of the discovery, D. L. Rose No. 1-A Mary Harbough has been completed in Shackelford County, Texas. The Ellenburger producer was drilled to a total depth of 4382, and had a calculated potential of 443 bbl daily with gas-oil ratio 454 to 1.

## Wyoming Test Successful

The Marion D. Smith venture, Brown No. 1, half a mile from production in Byron field, Big Horn County, Wyoming flowed 100 bbl of 51.2 gravity oil per day through $\frac{1}{32}$-in. choke from Frontier on recent tests. Frontier was topped at 2715 ft and 5½ in. casing cement on it. Total depth is 2757 ft. The producer was classified as a new pool discovery as there are 2 dry holes between the new well and the field proper.

## Colorado Wildcat Planned

A rank wildcat for Moffat County, Colorado has been announced by Cities Service Oil Company. Situated on the Wyman lease, the 6500-ft test is planned to the Weber sand. Nearest production is the Moffat pool, approximately 8 miles west of the Cities Service wildcat, and the Iles field, which is about 13 miles west of the test. These fields produce from the Sun Dance and Dakota sands. These sands will be tested in the Cities Service wildcat. The wildcat is 16 miles southeast of Craig, Colorado.

## Nebraska Has Big Gas Well

Ideal Drilling Company's Bosley No. 2 in the Big Springs area of Deuel County, Nebraska showed an estimated 10,000,000 cu ft of gas in the first sand, topped at 3268 ft. The well is about 40 miles east of Cheyenne County production.

## Bishop Completes Producer

Bishop Oil Company has announced that its Briggs Well Number 1-A, in Runnels County, Texas, has been completed with a flow of 106 bbl per day through a 12/64-in. choke. The well went to a depth of 4391 ft. It produces oil of 43 degree gravity. Casing and tubing pressures are 700 and 75 lb, respectively.

## Wildcat Makes 120

Claude Litteral No. 1 Cavitt estate, opens a new Falls County, Texas pool three miles northeast of Lott. The well is credited with making 120.8 bbl through ¼-in. choke on an official 24-hr test. Pay is coming from acidized sections at 1075-1121 total depth.

## Big Well for Ohio

Licking County, Ohio got one of its biggest wells in years recently. The new well, situated in Bowling Green township, is Midland Oil Company and others' No. 6 S. H. Cooperrider. It was completed for 625-bbl a day from the Clinton sand at a depth of 3007 ft.

## Stake Deep Test

Cities Service Oil Company (Delaware) and Continental Oil Company have staked a deep wildcat in Upton County, Texas, which is expected to test the Permian, Pennsylvanian, Devonian, and Silurian limestones and the Ellenburger dolomite. The well is expected to be drilled to 12,000 ft.

The wildcat is University AH No. 1. Nearest production to the wildcat is the Benedum field, approximately 6 miles north. This field produces from Ellenburger and Pennsylvanian.

## Small Kansas Pool Opened

Crown Oil Company, Inc. has opened a new oil pool in Stafford County, Kansas with completion of its No. 1 Van Winkle. The new Van Winkle pool is two miles west of the Pundsack field. It made its test at 3710 ft. plug-back depth in the Lansing-Kansas City horizon after trying deeper Arbuckle. It was listed as a 75-bbl-daily pump potential.

## Exploration Group to Meet

A regional exploration meeting has been scheduled in Fort Worth, Texas on November 30-December 1, sponsored by the Fort Worth Geophysical Society, the Dallas Geophysical Society, the Dallas Geological Society, the Ark-La-Tex Geophysical Society, and the Geophysical Society of Tulsa. The general theme of the meeting will be exploration problems, both geological and geophysical, of a number of oil provinces of the south-central U. S.

Various papers will be presented covering the geology and geophysics of the various provinces. These will be augmented by papers dealing with seismic velocity problems.

James L. Morris, president of the Fort Worth Geophysical Society and H. C. Vanderpool, president of Fort Worth Geological Society, are general co-chairmen of the meeting, and George H. Harrington, Jr., is chairman of the program committee. They will be assisted by T. R. Shugart, president of the Dallas Geophysical Society; Richard Brewer, president of the Ark-La-Tex Geophysical Society; H. M. Thralls, president of the Geophysical Society of Tulsa; and Lorenz Shock, president of the Permian Basin Geophysical Society.

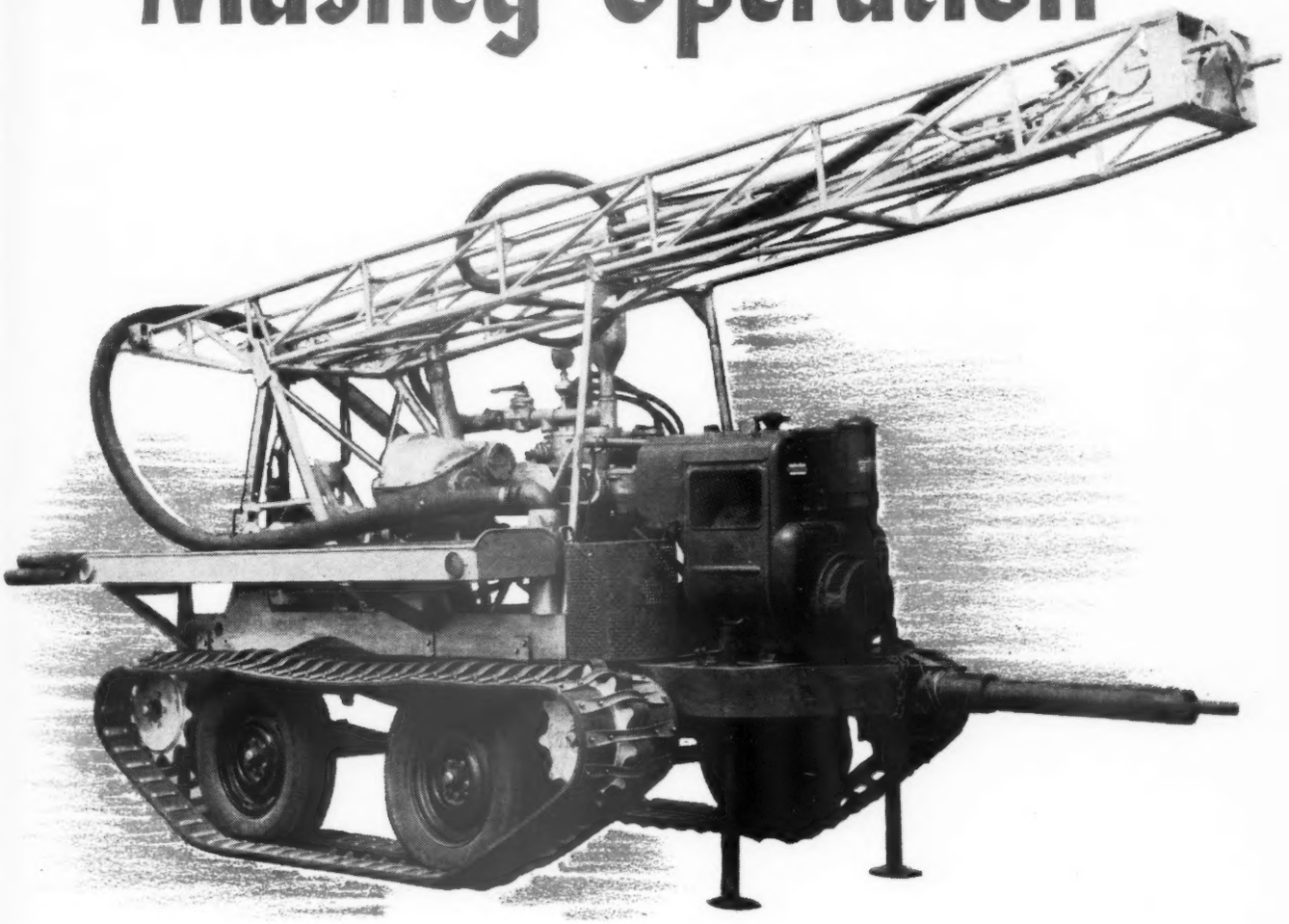

*Complete* **ENGINEERING ANALYSIS**

- **CORE**
- **GEOCHEMICAL**
  *Mineral Determination*
  *Clay Determination*
  *Radioactivity*
- **OIL and GAS**
  *Fractionation*
  *P. V. T.*
- **PALEONTOLOGICAL**
  *Microfauna Determination and Correlation*

Core Sampling • Airborne Service
*Affiliate*
PETROLEUM INDUSTRY CONSULTANTS C. A.
Edificio Carabobo—Caracas, Venezuela

**PETROLEUM ENGINEERING ASSOCIATES, Inc.**
709-711 SOUTH FAIR OAKS AVENUE
PASADENA 2, CALIFORNIA

# *Developed for*
# Muskeg Operation



THE MAYHEW 200 was developed for the muskegs of Alberta, the swamps of South America, the marshes of the Gulf Coast or any area where difficult terrain is the paramount problem. The unit as shown is so designed that it can be removed from the trailer and truck mounted, using the same drive shafts to connect to the truck engine, thus making it the most versatile lightweight drill in the field today! With seven models to choose from Mayhew offers the most complete line of portable drills of any manufacturer in the field.

DALLAS
MAYHEW
TEXAS

*If Your Drilling is from 100' to 4000' Write*

**MAYHEW MACHINE & SUPPLY CO.**

2713 CANTON STREET DALLAS, TEXAS

*BRANCHES IN* LUBBOCK, TEXAS AND CASPER, WYOMING

*IN CANADA*

SEISMIC SERVICE SUPPLY LTD., CALGARY AND EDMONTON, ALBERTA

*EXPORT*—D. T. O'CONNER, 500 FIFTH AVENUE, NEW YORK CITY, NEW YORK

# running tour with men in the industry

▸ **A. C. (Cy) Rubel,** vice president in charge of exploration and production of Union Oil Company has been elected a director of Lane-Wells Company. Rubel, who is also a director and a member of the executive committee of Union Oil Company, began work with that company in 1923 as an

A. C. Rubel

exploration geologist. Then he served as petroleum engineer, field superintendent, division superintendent, manager of exploration, before reaching his present position.

He received his degree in mining engineering and metallurgy from the University of Arizona, and after the war spent 3 years as exploration geologist for various oil companies in Mexico and Central America.

▸ **M. R. Shaffer** of Bartlesville, Oklahoma production division of Cities Service Oil Company, has announced his resignation to enter petroleum work at Tulsa. As petroleum engineer and office manager for Cities Service, Shaffer's experience covers the field of exploration, development, evaluation, and administration. He was first employed by the company in 1939 and served as petroleum engineer in East Texas, East and West Kansas, moving to Bartlesville as office engineer in 1943. He served in the executive phase of the production division as assistant office manager from 1945 to 1948 and was named office manager and executive assistant in 1948.

▸ **B. B. "Barney" Hayes** has retired after almost 26 years of service in the land department of Skelly Oil Company. For the last five years he has been division landman in Oklahoma City for Skelly, and for the last 18 years he has been head of either a district or a division office.

▸ **Morris Muskat,** director, physics division, Gulf Research and Development Company, was transferred to the Pittsburgh general office, production department, and appointed to the position of technical assistant to **Dr. K. C. Heald,** vice president and director, Gulf Oil Corporation. A graduate of Ohio State University, Muskat has been with Gulf for 21 years. Upon receipt of his PhD at the California Institute of Technology, Muskat joined the research department of the Gulf Production Company in 1929.

**Frank Morgan,** who has been with Gulf since 1936 was appointed director of the physics division, succeeding Muskat, and **Norman D. Coggeshall** has been promoted to the position of assistant director.

**R. B. Ross,** geophysical supervisor in the Tulsa district for the geophysical operations division of Gulf Research and Development Company was transferred to Harmarville as assistant director of the geology division and chief of the geology-geophysics section.

▸ **R. R. (Denny) Jackson** has been appointed head of the West Texas geological department for Signal Oil and Gas Company at Midland, Texas, where Signal will open an area land office shortly. He was with the Cities Service Oil Company before joining Signal Oil.

▸ **C. J. (Joe) Kerwin** and **John H. Douma** will supervise Sunray Oil Corporation's production department activities in the company's Mid-Continent division.

**J. R. Vandever** is general superintendent of Sunray's producing activities in the Mid-Continent division, which comprises Kansas, Oklahoma, Texas, Illinois, Mississippi, Arkansas, Louisiana, New Mexico, and Wyoming. Under the new alignment, as a result of the merger of the former Barnsdall Oil Company properties into the Sunray organization, Kerwin will be assistant superintendent for Kansas, Oklahoma, North and West Texas, and New Mexico properties. Douma will be assistant superintendent for the Sunray properties in Arkansas, Louisiana, Mississippi, and Gulf Coast and South Texas.

Kerwin joined the Sunray organization in 1948, having formerly been associated with Cities Service and the British-American Oil Producing Company. Douma was formerly superintendent of the development and crude oil operations section for Barnsdall, joining that company in 1938.

Sunray's field supervision for producing activities will be as follows: Kansas—**C. C. Shreve,** superintendent; **Fred M. McDaniel,** assistant superintendent; **Keith Lindley,** district engineer, **Hobson Mann,** engineer.

Oklahoma—**Alvin R. Summers,** superintendent; **I. T. Simmons,** assistant superintendent; **V. L. (Fred) Smith,** assistant superintendent; **R. R. Rothrock,** district engineer. **Freeman Hill,** engineer; **Carl W. Moot, Jr.,** district engineer; **Willard Roy,** engineer; **J. F. (Duke) Dingee,** district engineer, **Tom Allen,** engineer, Wewoka.

North and West Texas—**Perry A. Gill,** superintendent, **M. S. Patton,** engineer; **Don Hall, C. C. Brunton, F. W. Ficklin,** engineers; **J. F. Binkley,** district engineer; **T. A. Bedillion,** engineer, **Gordon Hillhouse,** engineer, Snyder; district superintendents, **A. J. McQuiston,** Hobbs, N. M.; **Lee Pruitt,** Odessa; **Vaughn Knight,** Snyder.

Gulf Coast and South Texas—**Carl E. Wilson,** superintendent, **Fred Goddard,** assistant superintendent, headquarters at Alice; **Joe Peery,** district engineer, **Dudley Strother,** district engineer, **J. W. Sutherland,** engineer, Alice; **Herman Owens,** engineer, **Harold F. Weakley,** engineer, Victoria; **Glenn Marrs,** engineer, Nordheim; **Floyd Newlin,** engineer, **C. T. Ramsey,** engineer, Premont; **John Myrick,** district superintendent, Houston; **John Goodman,** district superintendent, Victoria; **Howard Fish,** district superintendent, Nordheim; **Charles Baker,** district superintendent, Premont; **J. A. (Jim) Parry,** district superintendent, Hebbronville.

Arkansas—**H. D. (Rags) Jones,** superintendent, headquartres at Lewisville; **Grant E. McClatchey,** district engineer, **W. M. Saylor,** engineer.

Lousiana—**A. E. Hoffman,** superintendent, **Carl Wilson,** district engineer, **George M. Harper, Jr.,** engineer, headquarters at Lake Charles.

▸ **J. C. Wells,** has been named assistant district superintendent of drilling and production for Richardson and Bass, Pointe a la Hache, Louisiana.

## McCULLOUGH SERVICES

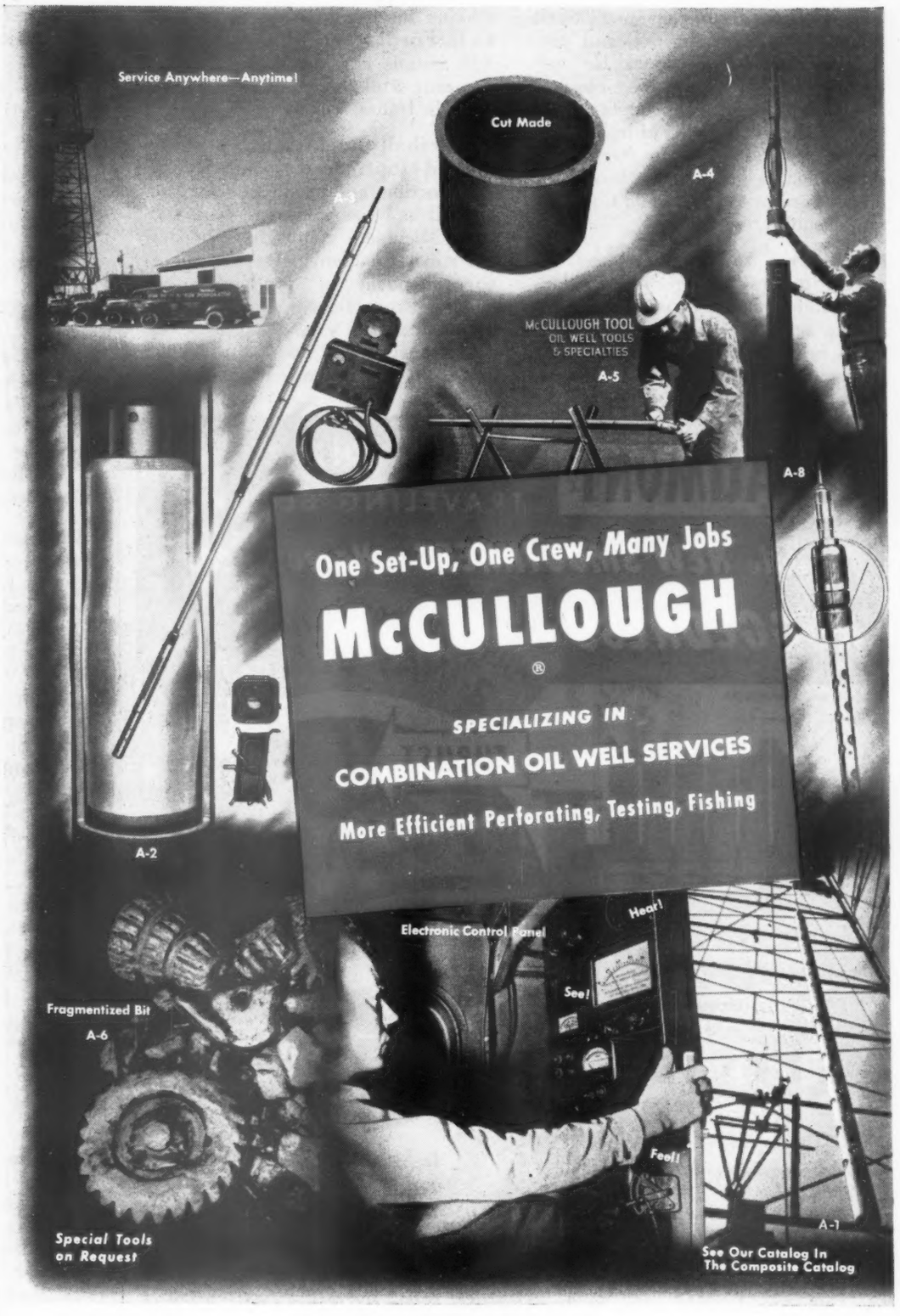
### A ELECTRIC WIRE LINE SERVICES

1. PERFORATING—Deepest penetrating burrless bullet and jet.
2. BRIDGING PLUGS—Drillable, expandable. McCullough and Baker.
3. MAGNA-TECTOR*—Locates stuck point of pipe, accurately, fast!
4. JET CASING CUTTERS*—World's fastest casing, tubing, drill pipe cutter!
5. JET BACK-OFF TOOL* and STRING SHOT—World's fastest way to recover stuck pipe!
6. JET BOTTOM HOLE CUTTERS*—Fragmentizes lost or stuck fish!
7. ELECTRONIC WEIGHT INDICATOR*—Super-sensitive, small, light!
8. SONIC DEVICE*—Locates collars, liner tops, well bottom, etc.

### B ROTARY SERVICES

1. DOUBLE ACTING ROTARY JARS* and BUMPER SUBS—Reduces number of fishing jobs!
2. SAFETY JOINTS—Releases quickly in emergencies!
3. EXTERNAL DRILL PIPE CUTTERS—For all outside pipe cutting.
4. MECHANICAL LONG KNIFE INTERNAL CASING CUTTERS—All sizes pipe, tubing.
5. THIN WALL EXTERNAL CASING CUTTERS*—For outside cutting in small clearances!
6. ROTARY RELEASING OVERSHOTS—Completely encircles fish.
7. ROTARY RELEASING SPEARS—Engages or disengages at will.
8. GUN TESTER—Water shut-off, perforating, testing in one run.

*Exclusive McCullough Services




*Ask your McCullough service man about* ® *time-saving COMBINATIONS of these services*

# McCULLOUGH TOOL COMPANY

5820 South Alameda Street, Los Angeles 58, Calif. • 405 McCarty Street, (P.O. Box 2575) Houston, Texas

***Export Office:* Los Angeles, California**

**TEXAS:** Snyder, Alice, Houston, Cisco, Corpus Christi, McAllen, Odessa, San Angelo, Tyler, Victoria, Wichita Falls. **OKLAHOMA:** Oklahoma City, Guyman, Healdton. **MISSISSIPPI:** Laurel. **NEW MEXICO:** Hobbs. **KANSAS:** Great Bend. **CALIFORNIA:** Los Angeles, Avenal, Bakersfield, Ventura. **LOUISIANA:** Houma, Lake Charles, New Iberia, Shreveport. **WYOMING:** Casper. **CANADA:** Edmonton. **VENEZUELA**—United Oilwell Service Co., S.A.: Caracas, Anaco, Maracaibo.

▸ **Dr. Folkert Brons** has joined Shell Oil Company's exploration and production research division. He will work under **J. P. Murphy** on liaison and coordination of production research. He will succeed Murphy later in the year as associate director of production, when Murphy leaves for an assignment to the Pacific Coast regional staff.

▸ **J. Murray Williams** has been appointed general manager of the Atlantic Refining Company's foreign producing activities. For the past several years, he has been managing Atlantic's producing operations in Venezuela, making his headquarters in Caracas. **C. H. Ford,** whom Williams succeeds, will assume new duties in Atlantic's domestic crude oil production department in Dallas, Texas.

▸ **Marshall R. Joy,** has been appointed superintendent of drilling, construction, and production for Brazos Oil and Gas Company, Rosscommon, Michigan, a subsidiary of Dow Chemical Company. He resigned as superintendent of production for Toklan Production Company, Tulsa, Oklahoma. He was connected with Cities Service Oil Company for 20 years, serving in many capacities.

▸ **Newby C. Simpson,** former assistant superintendent of production for Gulf Oil Corporation in the Fort Worth, Texas district, has been named general assistant to **B. G. Martin,** assistant to the vice president in charge of production in the Houston area. Simpson joined Gulf upon graduation from Texas A. & M. in 1933. He worked first as a pumper, later as an engineer, and in 1948 was transferred to Fort Worth.

▸ **A. J. Monzingo,** who has been petroleum engineer in Magnolia Petroleum's Kermit, Texas producing district, has been transferred to the company's West Texas division offices at Midland to serve as a petroleum engineer there. He has been succeeded by **E. G. Bilderback, Jr.,** formerly petroleum engineer at Luling, Texas.

▸ **William Morris,** drilling superintendent for Exploration Drilling Company has been transferred from Terre Haute, Indiana to the home office in Washington, D. C.

▸ **Ben D. Leuty** of Bartlesville, Oklahoma, formerly chief civil engineer in Cities Service Oil Company's engineering division, has been named special assistant in the company's crude oil supply and transportation division. Leuty's new duties will include crude oil transportation studies pertaining to Cities Service interests in company-owned and affiliated pipe lines.

Leuty is a long-time employee of Cities Service, having joined the company as a junior engineer back in June of 1924. Since his work at Texas A. & M. College was in civil engineering, his permanent assignment with the company was in that line of work. He was first stationed at El Dorado, Kansas, transferring to Bartlesville early in 1930.

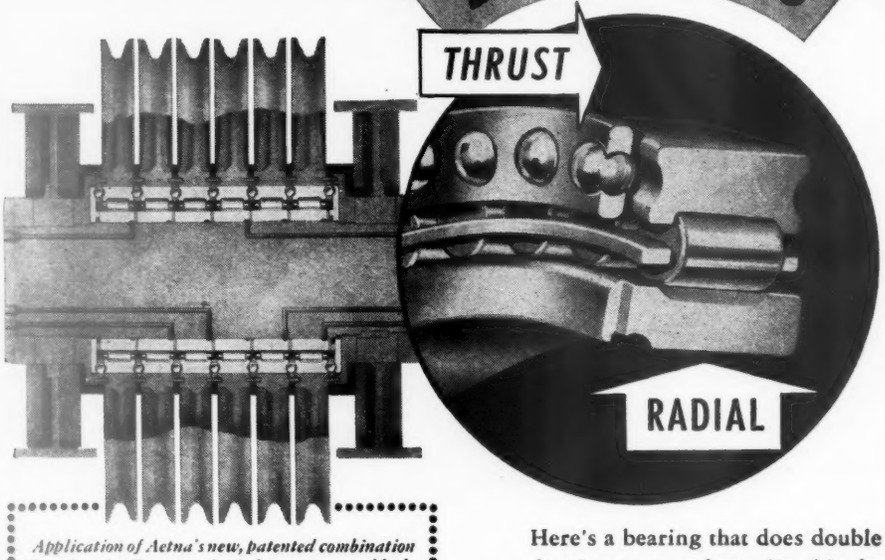
▸ **William D. Lewis** has been advanced to the post of senior geologist with the General Petroleum Corporation in the Bakersfield, California offices of that organization. Lewis has been with General Petroleum since 1945. He joined the company in Los Angeles as an assistant geologist and became a member of the Bakersfield office in 1948. Lewis was graduated from Denison University in 1938. He received his Master of Science degree from the California Institute of Technology in 1940.

▸ **C. E. George** has joined Anderson-Prichard Oil Corporation in Midland, and will be employed in the geology department. He was formerly geologist with Stanolind Oil and Gas Company in the West Texas district.


BEAUMONT© CROWN AND TRAVELING BLOCKS

*Provide* NEW SMOOTHNESS • Narrowness • RUGGEDNESS

WITH THE HELP OF THIS New Aetna 2-WAY BEARING




*Application of Aetna's new, patented combination bearing in Beaumont's 6-sheave crown block.*

Here's a bearing that does double duty in crown and traveling blocks—handles both radial and thrust loads as pure right angle loads—permits new block compactness that saves space, saves weight, saves money.

This new, patented combination cylindrical roller and ball thrust bearing is designed for use in blocks of any type, with any number of sheaves. Its 2-way, non-interfering load capacity attains lowest possible coefficient of friction, increases radial load capacity, lengthens bearing life, reduces risk of shut-downs, cuts maintenance and replacement costs to a new record low. Write for complete information on this and other Aetna oil country bearings.

**AETNA BALL AND ROLLER BEARING COMPANY**

4600 SCHUBERT AVENUE • CHICAGO 39, ILLINOIS

Aetna

STANDARD AND SPECIAL BALL THRUST BEARINGS • ANGULAR CONTACT BALL BEARINGS • SPECIAL ROLLER BEARINGS • BALL RETAINERS • HARDENED AND GROUND WASHERS • SLEEVES • BUSHINGS

NO RESILIENT SEAL...
NO SOFT PACKINGS...
NO WEAK SPOTS...

# IN RECTORHEADS

Its the seal that counts in Casing and Tubing Heads ... and in RECTORHEADS the seal is the point of greatest security, safety and simplicity.

**SECURITY.** The API ring gasket plus a good weld is immune to corrosion inhibitors . . . will not deteriorate . . . is fire-proof and there is no danger of leaks due to freezing. There is no packing to replace.

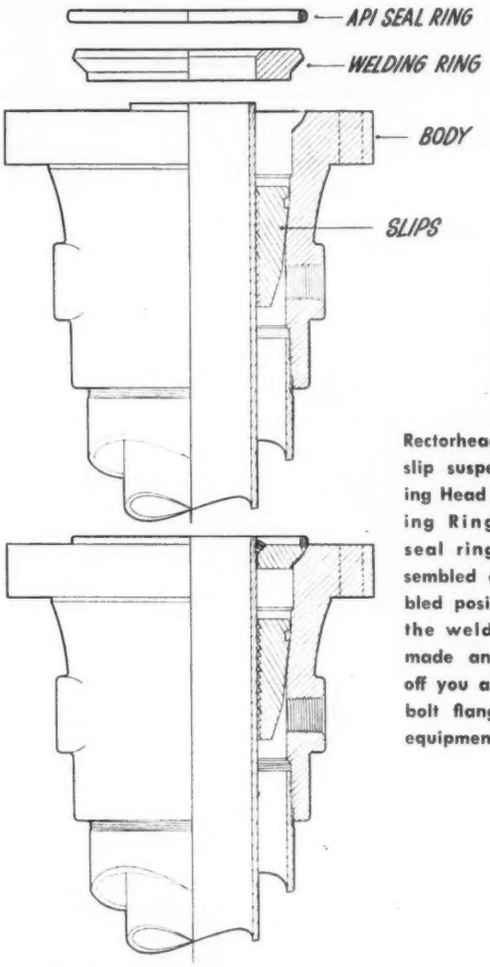
**SAFETY.** The welding ring, welded to the pipe and sealed at junction of head body with the API ring gasket establishes a "ring-of-steel" seal that is permanently leak-proof.

**SIMPLICITY.** No complicated packing arrangement to be seated in head around pipe and tighten down with studs, screws, or weight of casing string. When welding ring has been welded to pipe it is seated in head body, API ring gasket put in the groove and subsequent head flanged in place.

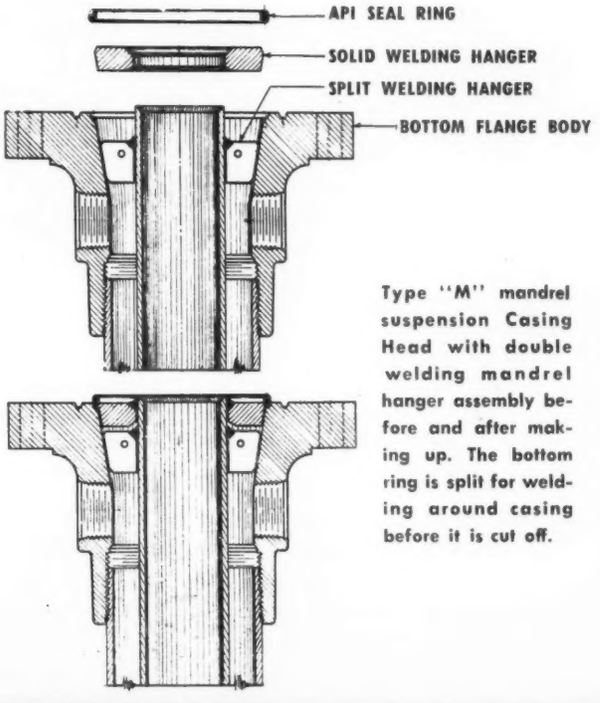
For greatest safety, security, and simplicity in well heads be sure to specify RECTORHEADS from surface string through Christmas Tree. Ask your Rector Representative, Supply Store or write for catalog.

**RECTOR WELL EQUIPMENT CO., INC.**
FORT WORTH, TEXAS

Ft. Worth Plant: 1100 N. Commerce St. Houston Plant: 2215 Commerce St.
REPRESENTATIVES IN ALL ACTIVE FIELDS




Rectorhead, Type RH slip suspension Casing Head with Welding Ring and API seal ring in disassembled and assembled positions. After the weld has been made and pipe cut off you are ready to bolt flange or other equipment to body.




Type "M" mandrel suspension Casing Head with double welding mandrel hanger assembly before and after making up. The bottom ring is split for welding around casing before it is cut off.

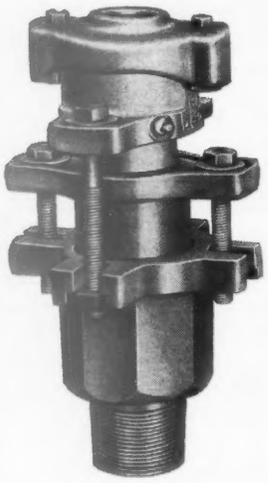
RECTOR

RECTORHEAD

MAKING THE OIL INDUSTRY SAFER!

ASSOCIATION OF WELL HEAD EQUIPMENT MANUFACTURERS CERTIFIED

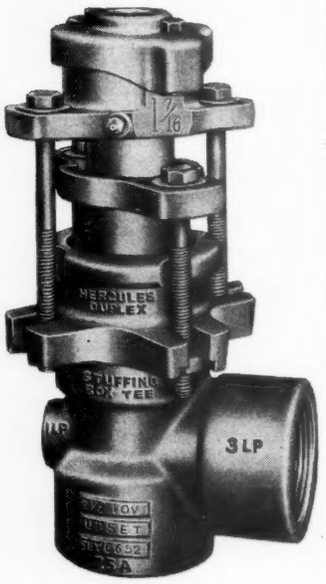
# Hercules Red Tools
## "Designed to Stand Out Built to Stand Up"

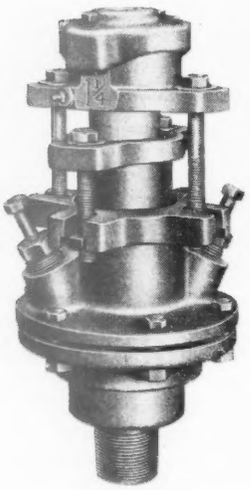


All Hercules Duplex Polished Rod Stuffing Boxes are Cone Packed for longest possible life and greatest economy. Illustrated (left) is Regular Type. Write for Bulletin 120-SB.

The Tee-Base Type Combination Stuffing Box and Tee (directly below) have been proven by years of service and savings to producers. Write for Bulletin 121-SBT.

A double packed Stuffing Box for use under most adverse pumping and flowing conditions (below). Be sure to order Type A-123-SBDP.



For greater savings, replace old style Upper Glands with the New Hercules Lubricating Upper Gland, as shown on Stuffing Boxes illustrated.

**SOLD AT ALL SUPPLY STORES**

*California Representative:*
L. T. (Ted) WALTIMIRE
Phone 4-4169—P. O. Box 1612
Bakersfield, California

*Export Representative:*
OIL FIELD EQUIPMENT CO., INC.
T. E. WARD, *President*
30 Church St., New York 17, N. Y.

**HERCULES TOOL COMPANY**
*Manufacturers of Oil Field Equipment*

General Office and Plant: 17th and Phoenix, P. O. Box 286 — TULSA, OKLAHOMA — Telephone 3-1186, Cable Address "HERTOCO"


▸ **John R. Miller** has joined the Rocky Mountain geological staff of Pacific Western Oil Corporation with headquarters in Casper, Wyoming. He was formerly area geologist at Casper for Stanolind Oil and Gas Company.

▸ **John A. Veeder** was recently named district geologist by Amerada Petroleum Corporation for the Permian basin of West Texas, replacing **Carl Barnhart,** who has been transferred to Tulsa. **Everett Carlson** has been transferred from San Antonio to Midland, Texas, geological staff for the Permian basin district, and **James LeRoy Harden** and **Lawrence Myers** have been added to the geological department in Midland.

▸ **Kenneth J. Langley** announced the marriage of his daughter, Margaret Grace, to Cecil Scott Richardson in Buenos Aires recently. Well known in petroleum circles, Langley was formerly employed with *The Oil and Gas Journal* and *The Petroleum Engineer.* He is connected with American export of petroleum equipment with offices in Buenos Aires.

▸ **J. J. Schillinger,** right of way agent for the General Petroleum Corporation, has been advanced to the post of assistant manager of the Right of Way Department. A veteran of 22 years service with General Petroleum, Schillinger joined the company as a messenger at the age of 17 and has worked for General Petroleum continuously since that time.

▸ **R. W. Biggart,** consulting geologist of Oklahoma City, Oklahoma, has joined Foundation Oil Company as exploration geologist. **Lloyd E. Worley,** vice president and manager of land and geological department of Foundation has reported that henceforth the company plans to enter an increased exploration program. Biggart was formerly with British-American Oil Producing Company and Deep Rock.


# Free Your "Hands"

**for other important work . . . use**

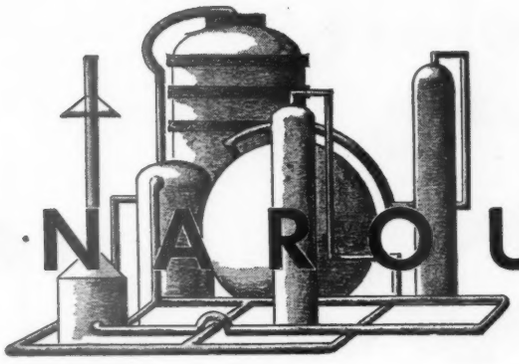
## GEOLOGRAPH
### MECHANICAL WELL LOGGING SERVICE

Geolograph gives you accurate drilling time, guide for bit change, round trip time and shutdown time. Reduces number of failures in drill stem testing! This data — and more — you get with Geolograph — while, at the same time, it frees your "hands" for other important work!

HOUSTON, ODESSA & WICHITA FALLS, TEX. • CASPER, WYO.
SHREVEPORT & BATON ROUGE, LA. • BAKERSFIELD, CALIF.

"TIME WILL TELL"
THE GEOLOGRAPH CO. INC.
P. O. Box 1291 — Oklahoma City 1, Okla.

# THE TURN AROUND



### Foreign Refining Capacity

Time sees the enlargement of foreign refining capacity with a mixture of feelings. This means more crude refined nearer its source, less dependence on American refiners, and smaller markets for our refinery products. Even though many of these barrels refined abroad are produced and refined by American companies using American capital, equipment, and processes, most of the work is done by non-American employees. Hence we have less work for American refinery operators to do, a problem that looms large among the many problems faced by our economy.

Such developments are inevitable; refining home crude at home is a tenet of our scheme of things, so it is natural that foreign governments should see it the same way. Abadan is the largest single aggregation of refining units and capacity in the world; its operations are discussed at some length in this issue. Venezuela, the United Kingdom, and The Netherlands are among other nationalities developing refining capacity. We can, however, do our best to keep ahead in our processes and our economies, and in the yields and quality of our products. Tearing down a competitor accomplishes nothing constructive but we can keep ahead with the spirit of progress.

### Cat Cracker Charge Stocks

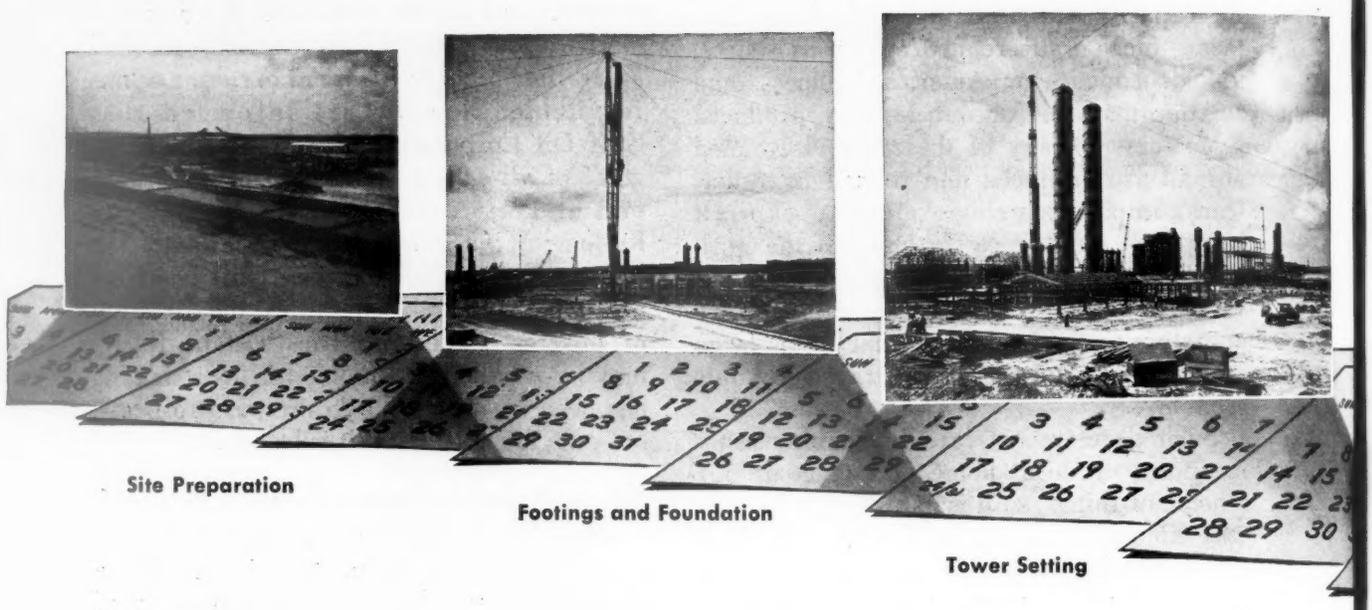
The huge expansion of catalytic cracking has given new life to an older process, delayed coking operations by thermal means. New and old delayed cokers are operating at full tilt—making thermal cracked gasoline and the maximum of charge suitable for cat cracking or for other important purposes. The nose-dive of the heavy fuel oil market, accelerated by the adoption of diesel-electric locomotives by railroads and for other uses has added impetus to the coking process expansion. Hardly more than one per cent of the locomotives on order in 1949 were listed as steamers and all the remainder were diesel-electrics and cat cracking capacity reached an all-time high, so the trend to coking seems inevitable. Now we are informed that Gulf Oil Corporation is building the "biggest" of all cats, a 60,000 bbl per day fluid unit at Port Arthur, Texas, engineered by Kellogg. Without increasing importantly the refinery throughput, the plant will boost octane ratings and other qualities; the direction of progress is certain. The "Octane Race" may have halted or stumbled in its stride, as has been reported, due to the war-prospects, but only for an instant, it is believed.

### Alcohol and Benzene—From Where?

Shortages in the world alcohol (ethanol) market accentuate the matter of from where shall we obtain the increased quantities of alcohol for industrial (not beverage) purposes. Ditto benzene, in peacetimes a by-product of coal coking. Synthetic ethanol—"grain" alcohol—from petroleum is quoted recently at 45¢ per gallon; from molasses and grain, 75¢. Alcohol is dehydrated to make ethylene, one of two intermediates for styrene, itself one of two intermediates for synthetic rubber, output of which is being boosted rapidly for war reasons. A large and indeterminate "X" in this equation, so far, is the potential alcohol production from byproducts of the Fischer-Tropsch plant at Brownsville. This unit, wrestled with for three years by its backers and just now in preliminary operation, reportedly has expected trouble in separation of the innumerable raw products found in the water-soluble part of the synthetic product. Benzene can be synthesized directly or separated by fractionation from various refinery streams. Looks as if some old plants must be reactivated, maybe.

—A.L.F.

# your project "Scheduled by



Site Preparation

Footings and Foundation

Tower Setting

**Scheduled by Lummus** means engineering and construction is a complete integration of planning, forecasting and cost control, applied with individual responsibility from start to finish. Lummus' complete scheduling of your refinery project smooths the work flow. There is no wasted effort. You can count on delivery of an economical, well functioning plant on or before the required completion date.

**Scheduled by Lummus** means plant engineering starts earlier than conventional work planning. It begins with original process design and job engineering. Because time is money, the project is engineered from the start with emphasis on time-economies in the entire erection operation. Erection methods are analyzed in advance from the standpoint of practical application at the site.

THE LUMMUS COMPANY
385 Madison Avenue, New York 17, N. Y.

**LUMMUS**

CHICAGO—600 South Michigan Avenue, Chicago 5, Ill.
HOUSTON—Mellie Esperson Bldg., Houston 2, Texas
The Lummus Company, Ltd., 525 Oxford St., London, W-1, England
Société Française des Techniques Lummus
39 Rue Cambon, Paris 1er, France
Compañía Anónima Venezolana Lummus—Edificio "Las Gradillas"
Esquina Las Gradillas, Caracas, Venezuela

Abadan refinery as seen from the Shat-el-Arab River.

P 741.

# OPERATIONS AT ABADAN

*Processing half-million barrels a day of eastern crudes in world's largest refinery utilizes some of the greatest units in existence.*

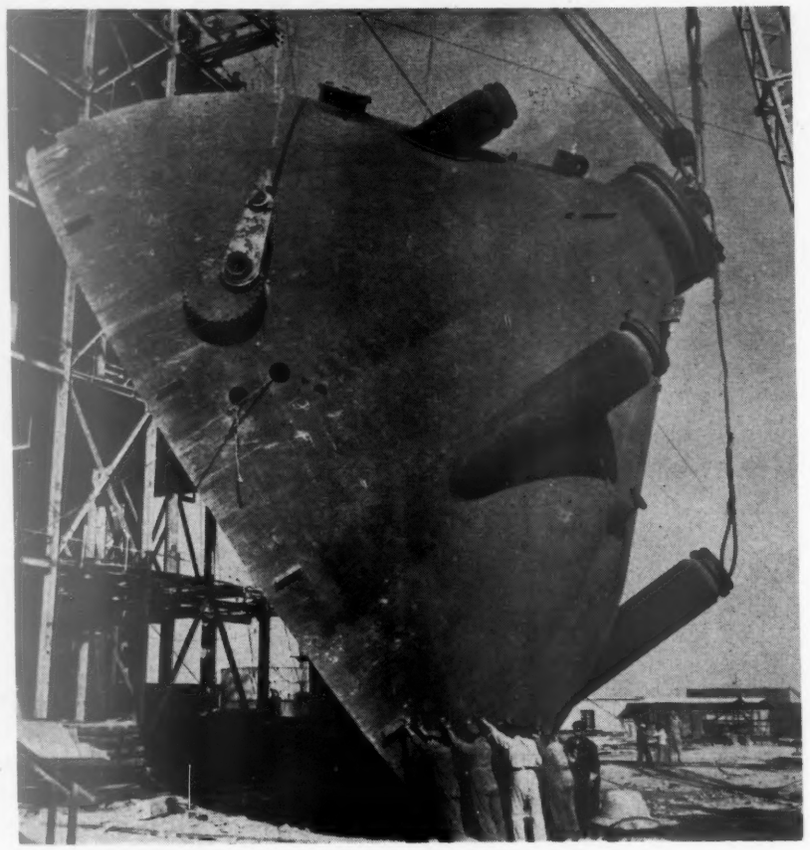
V. S. SWAMINATHAN

OPERATIONS of the world's largest crude oil refinery, the Abadan plant of the Anglo-Iranian Oil Company in Iran, are of more than ordinary interest. The refinery is designed to process 500,000 bbl per day of crude. Thermal conversion facilities comprise a reforming installation rated 125,000 bbl per day. Crude oil distillation is obtained with atmospheric and vacuum equipment. Moreover, before the end of 1950 one of the latest type of catalytic cracking units will be installed and operating. The capacity of existing facilities is sufficient to provide suitable and ample feedstock for the catalytic cracker.

Turning to crude oil supplies the oilfields of South Iran were the first producing areas to be opened up in the Middle East. Since their discovery in 1908 these fields have maintained a steady increase in output, and as far as can be judged from available information this upward trend appears likely to continue. Once drilling difficulties are overcome oil is relatively easy to produce, and is available in great quantities. Iranian wells have the largest producing rate in the world, the average over all fields is 1250 long tons a day (10,000 bbl per day) per well, while individual wells can produce as much as 4000 tons per day. The control of this production, the efficient drainage of these reservoirs and insuring maximum recovery without undue waste all call for a thorough study of underground conditions, and collection and interpretation of an enormous amount of physical data. The large numbers of wells drilled in the parent field of Masjid-i-Sulaiman enabled this basic information to be collected and the mechanism of production studied.

The reservoir rocks are large anticlinal structures of Lower Miocene to Oligocene age (known locally as Asmari limestone) with an average porosity of 5 per cent. Intense folding and flexing of this rock mass has cracked and fissured it extensively, and this feature is responsible for the very fluid connection throughout the reservoir. These fissures are, however, small, normally less than 0.1 in. in width. It is reckoned that about 80

EXCLUSIVE



Catalytic cracking cone, which weighs more than 100 tons, being raised to position.

per cent of the recoverable oil is stored up in porous limestone, and only 20 per cent in fissures. Oil in the reservoir is saturated with gas to pressures which vary in each field and with depth.

As soon as possible after production starts gas, oil and water levels and pressures are accurately observed and recorded, under uniform conditions. Also, there are wells specially sited for observation purposes only, which enable a watch to be kept on water, oil, and gas levels, and on their movement as production is drawn off. Profiting by the experience gained in such observation wells drilled early in producing life in Haft Kel field it had been found possible to maintain a perfect balance throughout the entire field, and to gather evidence of the upsetting of levels before damage can be done and apply rectification measures to the output quotas that would restore the levels to stabilizing production.

*Spacing* of wells to obtain efficient drainage is not so important under Iranian conditions where migration is relatively free. The choice of *sites* of wells is important from the standpoint of using the longest possible producing life.

In the Agha Jari field the flowing capacity of wells is high, average production capacity per well being of the order of 22,000 bbl a day. As production units are now designed for a throughput of 176,000 bbl a day, a group of 8 to 10 wells is required to feed a central point. An arbitrary limit of 4 miles has been fixed for the flow lines, and a well spacing of one mile, adopted. Though wells in all fields except Masjid-i-Sulaiman are usually capable of producing 14,200 bbl per day at the initial test acid treatment is nevertheless applied. Thereby production of wells is invariably increased, and outputs of the order of 24,800 bbl per day are frequently achieved.

The first production system installed in the Masjid-i-Sulaiman field followed more or less orthodox lines, and included well-head separators, atmospheric flow tanks and collecting units and a gas absorption plant for recovering light fractions. In fields developed since higher flowing pressures have enabled a simpler and more efficient system to be installed. This dispenses with all tankage, the refinery being, in effect, directly connected to the reservoir. The energy of wells is utilized to replace prime movers, pumps, etc., in the system. The separation of gas is accomplished so that all possible light fractions are retained, and varying qualities of crude can be delivered to the refinery. Last but not least, the entire production system is automatically controlled, thus dispensing with manual operation.

Crude oil flowing from the well first passes through a flow controller, which regulates the amount required from the well. It next passes into a high-pressure separator, which takes off all free gas. From this it is delivered through a graded pipe line system to the central stabilization unit. Five such units are now installed, of capacities 44,000-176,000 bbl per day. This arrangement is designed to retain butanes and pentanes in the crude by the process of releasing the dissolved gases in a number of stages of decreasing pressure. Data relating to the installation at the Agha Jari field make instructive reading:

| | |
|---|---|
| Capacity | 165,000 bbl a day |
| Source of crude | 8 wells |
| Gravity of crude | 36 API at 60F |
| Gas-oil ratio | 150:1 |
| Temperature | 140F |
| Well flowing pressure | 1,500-1,600 psi |
| Stages of stabilization: | |
| First stage separation | 1,150 psi |
| Second stage separation | 500 psi |
| Third stage separation | 180 psi |
| Fourth stage separation | 62.5 psi |
| Fifth stage separation | 29.5 psi |
| Sixth stage separation | 14.0 psi |
| Seventh stage separation at atmospheric pressure | ..... |
| Vacuum stage separation | 8 psia |

Because of the high temperature of the crude, which is approximately 140 F at well-head, the Agha Jari stabilization units include a battery of

**RESERVOIR DATA SHEET AS AT END OF 1949**

| Field | Year of discovery | No. of wells completed to end of 1949, including those used for production recycling and observation, abandoned wells and dry holes | Wells completed 1949 | Wells drilling at end of 1949 | Total producing wells at end of 1949 | Total production 1949 (barrels) | Av. daily production at end of 1949 | Reservoir pressure psi at end of 1949 |
|---|---|---|---|---|---|---|---|---|
| Masjid-i-Sulaiman | 1908 | 258 | .. | .. | 29 | 21,105,000 | 43,000 | —20 |
| Haft Kel | 1928 | 48 | .. | .. | 20 | 72,673,000 | 197,000 | 600 |
| Gach Saran | 1928–37 | 15 | .. | .. | 3 | 14,607,000 | 37,000 | 1,840 |
| Naft Safid | 1934–38 | 14 | 2 | 4 | 3 | 7,833,000 | 22,500 | 1,530 |
| Agha Jari | 1937–38 | 23 | 2 | 2 | 15 | 84,315,000 | 287,000 | 1,760 |
| Lali | 1938 | 11 | 2 | 2 | 2 | 3,020,000 | 7,500 | 1,650 |
| Naft-i-Shah | 1923 | 6 | .. | .. | 1 | 1,159,000 | 4,000 | 1,420 |

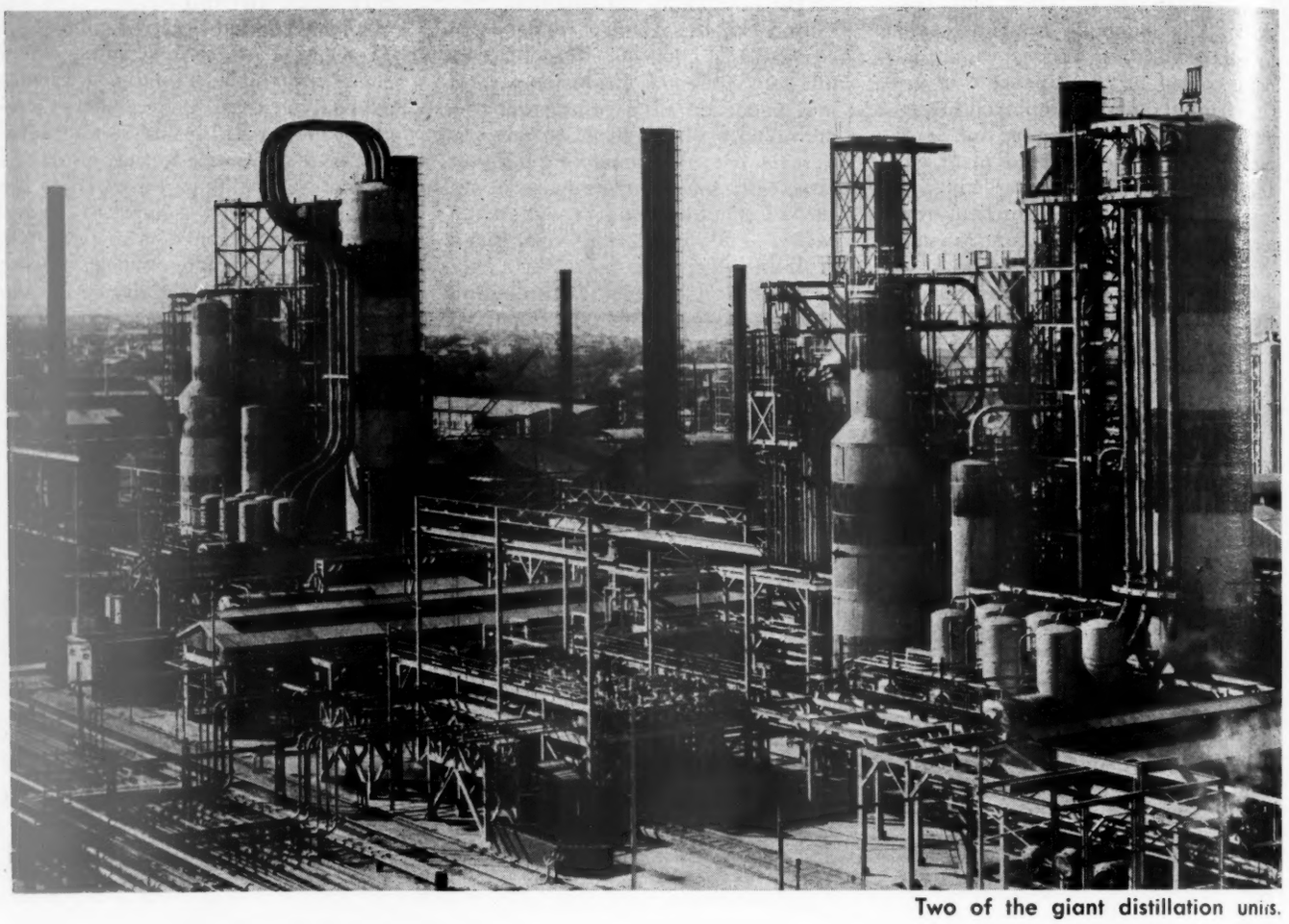
heat exchangers to retain light fractions. The incoming crude is cooled by the outgoing crude, which has been cooled by the expansion of gas. Gas from the unit is employed in various ways, i.e., to drive pipe line boosting pumps, electric lighting plant, etc., for firing boilers, plaster kilns, in forge and foundry, and for heat treatment domestically and for transmission to long distances.

The 20/22-in. line connecting the Agha Jari field with the port of Mashur was commissioned in April 1949. The main pipe line system in Iran now totals 1718 miles. An experimental center was recently set up to study corrosion at Dorquain, a pipe line pumping station between Abadan and Ahwaz, where exceptionally corrosive soil is encountered. Comparative tests are being made with bare, coated, and cathodically protected pipe to determine relative rates of corrosion. Magnesium anode technique is also being tried out. In 1949 over 2,470,000 tons of crude oil were exported from Mashur. New jetties and other facilities are in hand to expand the capacity of this important deep-water port, which is to accommodate the largest type of tanker now under construction.

In 1949, the Abadan refinery processed 23,245,000 long tons of crude oil, a record total. Problems pertaining to coordinating production of a multiplicity of products on so large a scale are of outstanding interest. Steady progress is being made in still further stepping up throughput capacity, and increasing operational flexibility. Construction of the catalytic cracking plant, with a throughput capacity of 35,000 bbl per stream day at 48-50 per cent volume conversion, and lubricating plant is well advanced, together with considerable extensions to steam, power, and water services. Most of the products of the refinery are shipped over jetties arranged along the left bank of the river. While about 5 per cent of the total output is distributed to local markets by pipe line, rail, and road-tank wagon and river and coastal craft, the rest is shipped by tanker.

Crude oil as received at the Abadan refinery is a mixture from the six fields: Masjid-i-Sulaiman, Lali, Haft Kel, Naft Safid, Gach Saran, and Agha Jari. The variation in quality from each producing field in Iran is very small, and this enables blending in a manifold to be carried out as it is. Absence of water and salt content makes it possible to use the reservoirs as equivalent to underground storage. The blended crude at the manifold at the entrance to the refinery is picked up by pumps direct from the main station lines, a boosting system maintaining the required suction pressure. The primary purpose of the crude oil storage tanks situated at the site is to cater for emergency shutdowns in the refinery of short duration so that there need not be a drastic, or violent, reduction of dispatches from the fields. In a smaller measure they provide some reserve storage. The loss of light ends is avoided when the crude is pumped direct to distillation units and the emission of obnoxious $H_2S$ fumes from the crude largely eliminated. By this arrangement the use of crude of up to 10 psi Reid vapour pressure is possible, which provides an easy method of bringing ethane and propane into the refinery for use as fuel. Since storage, pumping, and distillation of crude within the refinery call for careful control to tie in with deliveries from

Air view of the Anglo-Iranian refinery at Abadan with distillation area in the foreground.



Two of the giant distillation units.

the fields close *liaison* is maintained between producers and the refinery through a central source in the fields. In addition, at the Masjid-i-Sulaiman reservoir there are installed three topping units the function of which is to allow an enrichment of distillate or fuel oil into the crude being dispatched from this area, while the unwanted material is returned to the reservoir. During and since the war these units have provided a measure of flexibility enabling the available tanker space to be used to the best advantage. The fields production department take good care that the recycled products are pumped into particular wells in one particular field. Nearly 90 per cent of the crude comes from fields which have no possible contamination with such recycled products, and it is from these that export shipments are made. Close coordination prevails between estimating, operational, survey, and maintenance groups to insure that sufficient refining units are in good shape, and available, to handle the requisite quantity of crude. The motor driven crude oil pumping sets, each of 57,000 bbl per day capacity, have a total overall crude capacity of 570,000 bbl a day. They are housed in 3 separate pumphouses, each placed at a safe distance from the other to provide dispersal in case of fire.

The distillation capacity down to atmospheric residue consists of 4 large units, each of 85,500 bbl a day capacity, and 5 units, each of approximately 28,500 bbl a day capacity. With further increases in throughput, all in 85,500 bbl per day steps, loss in throughput occasioned by overhauling one of the larger units has been less marked. Being fully instrumented these units make minimum demands on operating man power. They are operated to yield the following fractions: Gas at 60 psi; primary flash distillate containing hydrocarbons in the $C_3$ to $C_6$ range; isoheptane base containing mainly $C_7$ hydrocarbons; straight-run benzine; naphtha reforming cut; aromatic cut for solvent extraction; unrefined kerosene for burning oil and vaporizing oil. and atmospheric residue. The last fraction undergoes further distillation using ancillary heaters and vacuum columns to provide gas oil, waxy distillates, and bitumen. These products form the combined output of several distilling units. The amounts of gas liberated on distilling 500,000 bbl per day crude is approximately 18,000,000 cu ft per day. Recovery of butane and gasoline from the gas is practised, the residual gas being used for the recovery of sulfur, after which it is blended into the refinery fuel gas system. An adequate venting system to atmosphere caters for emergencies. Major products marketed embrace aviation spirits, motor spirits, special boiling spirits, kerosenes, vaporizing oils, gas oils, marine diesel oils, fuel oils, and bitumens.

The PFD (primary flash distillate) obtained as the overhead condensate from the primary distillation (column-base pressure 70 psi) is passed forward to a series of fractionating columns for fractionation. Initial operation is carried out, employing high-pressure columns where propane and lighter hydrocarbons are liberated under controlled conditions to join with the gas from the primary flash equipment for $H_2S$ recovery, and subsequent use as fuel. The stabilized product, i.e., depropanized gasoline, contains approximately 25 per cent of butanes. The latter are recovered in a subsequent distillation and passed forward via a mercaptan-removal unit to the alkylation process for the re-

covery of isobutane amounting approximately to 20 per cent. The balance, i.e., normal butane, provides feedstock for the ancillary isomerization process. The provision of $C_4$ (about 8550 bbl per day) is the first link in the chain between crude oil and aviation spirit production. The integration of operations, whereby depropanization, debutanization, and de-isopentanization are carried out in successive columns being very close, is carefully maintained. Upon debutanization of the primary flash gasoline the product is quite stable at about 10 to 12 lb Reid vapour pressure, and suitable after treatment for inclusion in motor spirits, but all the isopentane in the crude oil is concentrated in this residual fraction. As isopentane is included as a blending component in aviation spirit a certain proportion of this debutanized gasoline is fractionated to provide the required amount of approximately 4000 bbl per day. Failure to produce butane and isopentane will not shut down the refinery but will slow production of aviation spirit. After removing isopentane the balance of the gasoline is split up, a portion being bled off for merceptan removal and then included in motor spirits, and the remainder passed forward to storage tanks, from which it is pumped to fractionating columns for the removal of about 5700 bbl a day of isohexane concentrate. By "topping" and "tailing" the isohexane base a product is obtained, which, after acid treatment and rerunning for sulfur removal, is employed as a blending agent for 100 octane spirit. The discarded materials are blended into naphtha-reforming stock.

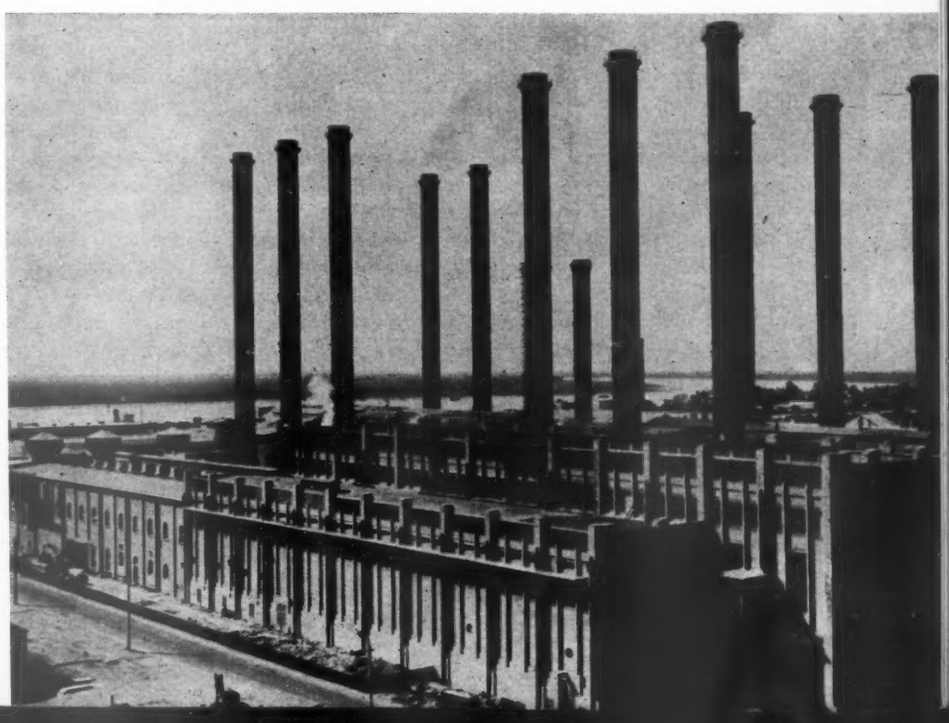
Of the fractions in order of volatility as they are distilled from crude under atmospheric pressure there is first the overhead product from the various atmospheric columns. This contains most of the isoheptane available in the crude, the bulk of which is used to provide an isoheptane-bearing base feedstock, while the rest may be used after sweetening as a straight-run benzine in the blending of motor spirits. The isoheptane feedstock is fractionated in a series of 100- and 50-plate columns, the "tops" furnishing an additional base feedstock for isohexane; the bottoms are blended with naphtha reforming stock. The middle cut, approximately 7100 bbl per day, is the isoheptane, which, after treatment with 98 per cent sulfuric acid and subsequent redistillation for sulfur removal, is blended in 100/130 grade aviation spirit. The remainder of the atmospheric column overhead product is refined to low-mercaptan sulfur content, and, along with cracked spirit, is used in blending motor spirits.

The first side stream from the atmospheric column is a product of approximately 0.760 specific gravity containing about 20 per cent of aromatics, which can be extracted with liquid $SO_2$ in an Edelenau type of plant. This extract after removal of sulfur has a fairly high octane rating and a high rich-mixture number. As the total amount of this particular fraction of the crude is more than that needed for aviation spirit base stock the balance is continuously passed forward to mix with the discards from the isoheptane and isohexane distillations, and the raffinate from the $SO_2$ extraction plant to provide the requisite amount of reformer feedstock. The primary purpose of reforming in Abadan now is production of butenes for the alkylation process. The cracked spirit produced from these reforming units is leaded, and therefore need not be of high quality. The amount of unsaturated $C_4$ derived from the reforming units controls the daily products of butene alkylate. Associated with the cracked spirit, and obtained from reforming these, is a pentane cut that can be fractionated out of the spirit, and alkylated with isobutane to provide pentene alkylate. The manufacture of aviation spirits, both 91/98 and 100/130 grades, demands production of isopentane, isohexane, isoheptane, benzine extract and alkylate. This calls for a proper coordination of plant operation, and subsequent treatment and blending to achieve optimum output.

Alkylation capacity at Abadan, consisting of three separate units, is 10,000 bbl per day. Associated with each unit is an isomerization unit, each of capacity 2000 bbl per day net isobutane. Two anhydrous hydrochloric acid manufacturing plants provide the HCl for activating the aluminum chloride catalyst in the isomerization process. Isohexane production is carried out using 1 by 50 plate and 2 by 76 plate columns. The isoheptane fractionators are 2 by 100 plate columns for the first operation or topping process, and 2 by 50 plate columns for the second operation, that is the removal of the isoheptane overhead. A 20,000 bbl per day $SO_2$-extraction unit provides the benzine extract of aromatics. Associated with it is an $SO_2$-production unit accounting for over two tons of sulfur dioxide per day. Sulfuric acid for the alkylation process is made in an adjacent area, where is also situated a plant for recovering $H_2SO_4$ by the destruction of sulfuric acid sludges. Electric power is supplied from the main power. Water cooling is provided by three cooling towers, each with a capacity equivalent to 2 million Imperial gallons per hour. Steam requirements are met from the area boiler battery with a maximum continuous rating of some 1,600,000 lb per hour.

The latest modified type of catalytic cracking unit nearing completion at Abadan has a throughput capacity of 35,000 bbl per stream day at 48-50 per cent volume conversion. It is designed to operate crudes above average in sulfur content, and incorporates separate reactor and regenerator vessels, a fractionator and feed pre-heater, all of which are in accord with practices when the unit was planned.

Power station.



Catalytic coolers, the waste heat boilers, and electric precipitator conform with prevailing practice.

On a designed basis this catalytic unit will produce gas, and gasoline (to 400 F end point), gas oil, cycle oil, and clarified oil. The gas and gasoline stream, amounting to 45 per cent by weight of fresh feed, will be processed in the gas plant. In this operation 90 per cent of butenes/butanes suitable for subsequent alkylation will be recovered. Provision is made for 50 per cent of total propene/propane in the gas to be recovered as a separate stream containing approximately half the $H_2S$ produced in the cracker. The debutanized gasoline, approximately 31 per cent by weight of fresh feed, will be passed to the splitter column, in which light gasoline of 200-250 F end point can be taken as an overhead end product. Following treatment the octane number of the total debutanized gasoline is estimated at 80 clear.

The gas oil stream, 19 per cent by weight of feed, will be steam-stripped before passing to storage. It will have a pour point of 0-5 F, and after treatment will be suitable for use as a fuel-diesel blending stock. Cycle oil, 23 per cent weight of feed, will be employed as a fuel oil blend stock. The operation is of the single-pass type, and due to the availability of sufficient fresh feed it is not expected that any of the cycle oil will be recycled to the cracker. The only occasion when shortage of fresh feedstock is anticipated is during the shut-down of the vacuum distillation units, in which case the cycle oil stream can be recycled to the unit. Clarified oil from the thickener, 8 per cent weight of feed, will, in all cases, be used as a fuel oil blend component.

Both the reactor and regenerator of the catalytic cracker are fitted with single-stage cyclone separators. The separator in the reactor is constructed of alloy. Each of the catalytic hoppers for fresh and hot storage is designed to hold the full catalyst inventory. Refractory lining is employed in the used catalyst inventory. Refractory lining is employed in the used catalyst hopper. To protect the reactor still and other pressure parts from corrosion the vessel is constructed of 11-13 chromium-clad plate. Similar protective measures have been taken in fabricating the fractionator. All the main pumps and the single centrifugal compressor in the catalytic plant are steam-turbine driven. Superheat for the steam supplied from operations of the unit is obtained with a fired unit, separate from but adjoining the cracker.

The refinery's regular steam system is tied into the catalytic unit's waste heat boilers, and other steam-generating equipment. Depending on operations of the catalytic cracker steam from the waste heat boilers is supplied to the refinery distribution system for operations other than at the catalytic unit, or steam may be had from other sources *via* the regular plant system for operations at the cracker.

For procuring suitable water from an adjoining river a circulating system has been installed in connection with a forced-draft cooling tower. This arrangement lowers the duty on the settling plant. To avoid contamination of cooling water in the event of failure in any of the tubular cooling equipment handling the heavy oil an API-type separator is installed in the circulating system. Effluent water from these coolers passes through the separator before it is run to the cooling towers. Evaporators are employed to insure high-purity water for the cracking plant steam generators. High-purity water is also used to condition the flue gases passing to the electrical precipitator. Evaporated water is moreover employed for spraying generated flue gas to forestall catalytic poisoning from the source.

Design of the gas recovery plant to be operated in conjunction with the cracker is the usual absorption type. In addition to its depropanizer, debutanizer, and other equipment it is furnished with a gasoline splitter, which yields light and heavy gasoline fractions. To accommodate utilization of certain existing equipment the absorber is designed to operate at about 52 psi. Refrigeration for this relatively low-pressure operation is supplied by an ammonia absorption system.

The main gas supply for firing the catalytic feed pre-heater and the steam super-heater is obtained from the plant's absorber. To guarantee an adequate supply of gas at all times for these operations the absorber overhead gas stream is fitted into the refinery's regular fuel-gas system. In an emergency both heaters may be fired with oil. Gas for compressor engine fuel is provided from the operations of an alkylation unit since the fuel for operating the engines is needed to meet a comparatively high standard of purity.

Because the refinery is far removed from supply centers substantial tonnages of catalyst, ammonia, and other materials are stocked locally. The catalyst is stored next to the cracking plant's hoppers, and ammonia on specially constructed racks provided with a travelling crane to facilitate the handling of large drums. Approximately 1000 long tons of catalyst will be consumed annually. For charging the unit nearly 300 tons of catalyst are needed. The catalyst store is provided with suitable rail accommodation. A stacking machinery facilitates the handling of drums containing the catalyst within the store and to the point of discharge to the catalyst elevating system. The ammonia store is equipped with specially designed racks and an overhead crane to speed up the handling of ammonia cylinders. The latter are of 8 cwt capacity, and are some of the largest ever made in Britain for transport overseas.

Auxiliary buildings include the main office and laboratory both forming one block and air-conditioned, like the catalytic unit control room, maintenance workshops and electrical substation. The laboratory is equipped to deal with normal routine testing and control of the catalytic cracker and gas plant products.

When on full crude oil throughput it is possible to produce in Abadan nearly 80,000 bbl per day reforming stock and 47,000 bbl per day straight-run gasoline. The ordinary grade of motor spirit is made by blending straight-run benzine, gasoline, and cracked spirit that has been corrected for vapor pressure by injection of the required amount of butane. Higher octane number premium grade motor fuels can be easily manufactured by utilizing part of the high grade components at present used in preparing aviation spirit. The reforming of naphtha is limited to the minimum required for the production of butanes provided the resultant cracked spirit is sufficient in combination with the maximum permissible TEL dosage to blend off all the straight-run motor spirit blending fractions. The pressure distillate from the reformers is stabilized to remove propane-propylene, which is used as refinery fuel and the depropanized material is further processed to make available the butane-butene for alkylation. Acid treatment, re-distillation, and final sweetening all follow in sequence as continuous operations.

Unrefined kerosene is obtained generally from the second side stream of the atmospheric distillation columns. It is treated by sodium plumbite to doctor negativity. There are three plumbite treatment units, each with a capacity of 14,300 bbl per day. The semi-refined product is passed via balance storage through bauxite driers to remove water so that kerosine may enter the $SO_2$-extraction

plants, and contact the $SO_2$ relatively water-free to reduce corrosion to a minimum. The bulk of the extract distillate is utilized in the manufacture of tractor vaporizing oil. The refined kerosine, amounting to 85 per cent by volume or 35,000 bbl per day, is pumped away promptly to final storage for shipment.

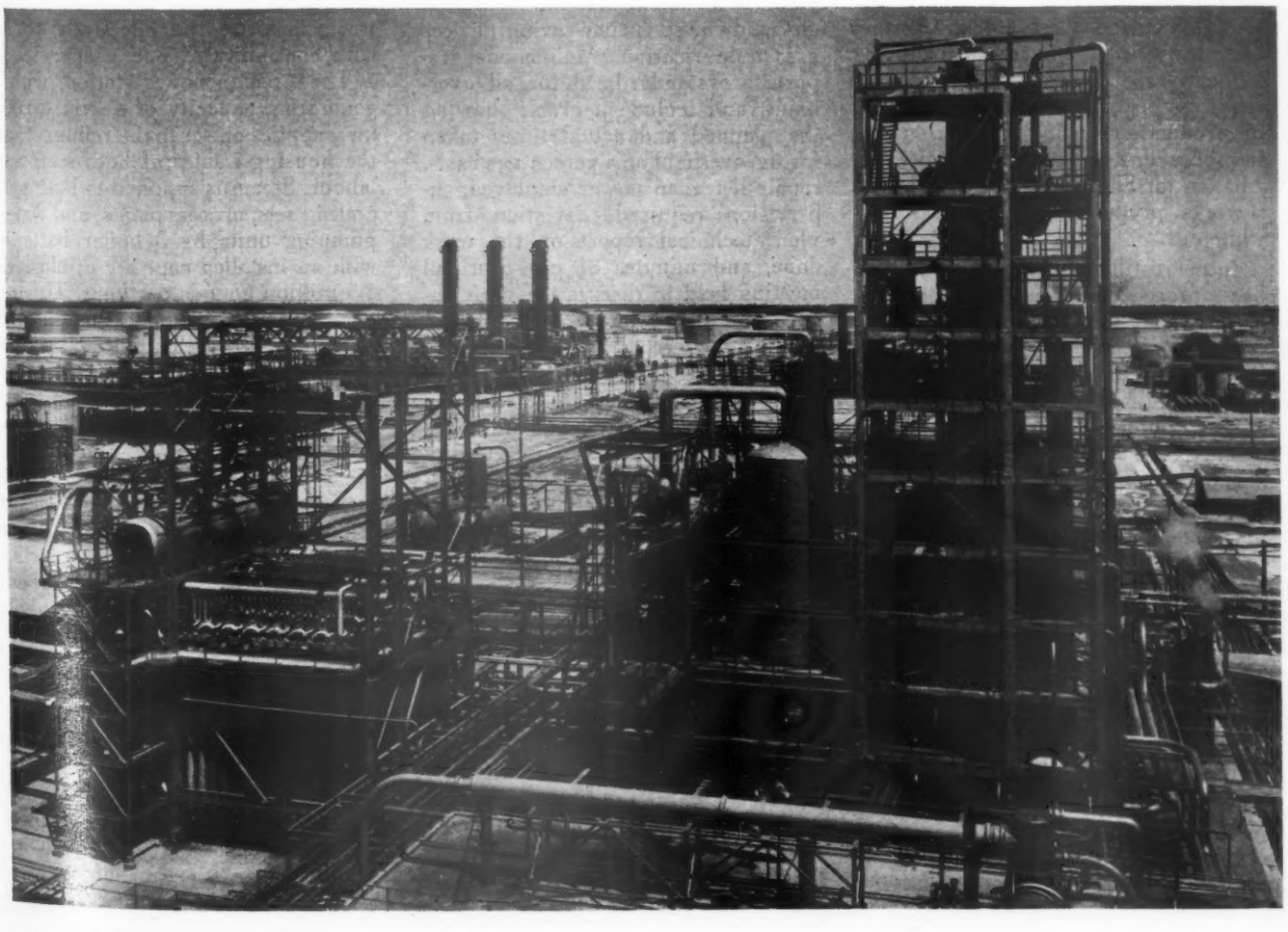
Tractor vaporizing oil is manufactured by blending the aromatic cut derived from distillation of the $SO_2$ extract from kerosene along raw kerosenes of diverse boiling ranges. The blend is treated with sulfuric acid to reduce sulfur content. It is mixed with a portion of the heavy cracked spirit to give the required octane number, distillation range, specific gravity, and low sulfur content demanded for the tractor engine. Gas oil for high speed diesels calls for no special treatment, and is withdrawn continuously from the distillation unit and pumped to storage in the tank farm. Production in this case is about 42,800 bbl per day.

The residue withdrawn from atmospheric columns is approximately 50 per cent of throughput, or 250,000 bbl per day. As it contains valuable gas oil part of it is subjected to vacuum distillation, from which are produced extra gas oil as an overhead product, waxy distillate as a side-stream product, and bitumen from the column base. The vacuum gas oil can be blended with kerosene and atmospheric residue to give the various grades of heavy diesel oils. The waxy distillates are blended with the residual bitumen, the balance of atmospheric residue and cracked gas oil and residue derived from the reforming of naphtha, to provide the various grades of fuel oil according to the viscosities and pour points, which are the main criteria. For some time white oils and middle distillates had been in such large demand that, despite enrichment of crude oil with distillate at the fields by operating the topping plants and discarding the residue, there had at times been a surplus output of fuel oil. It was therefore necessary to make use of the ultimate flexibility factor, i.e., the recycling of surplus fuel oil to the wells, as fuel-oil-storage tankage had been kept full.

Closely connected with the operation of the vacuum units is the production of base stocks for the various grades of bitumen. A close link prevails between the air-rectification stills and the vacuum distillation units. The supply of solvents for cut-back-bitumen production depends on the side streams being obtained from individual distillation units, and the continuity of operation unless cut-back-solvent storage is available. Intimately integrated with the bitumen production program is the supply of drums for packaging the various grades, and the drum manufacturing plant operation is made to tie in with the bitumen blowing and blending schedule.

Among other products manufactured are special-boiling-point spirits, including mineral turpentine. The production of white spirit is an integrated process of distillation of the required fraction on crude oil, its treatment, and subsequent redistillation. The manufacture of such petroleum chemicals as diisobutylene, cyclohexane, toluene, ethyl benzene, and paraxylene entails special arrangements, as special equipment is frequently needed that must fit into the ordinary refinery schedule. If it is not to interfere with the maximum production of alkylate the manufacture of diisobutylene demands an increased reforming of naphtha to pro-

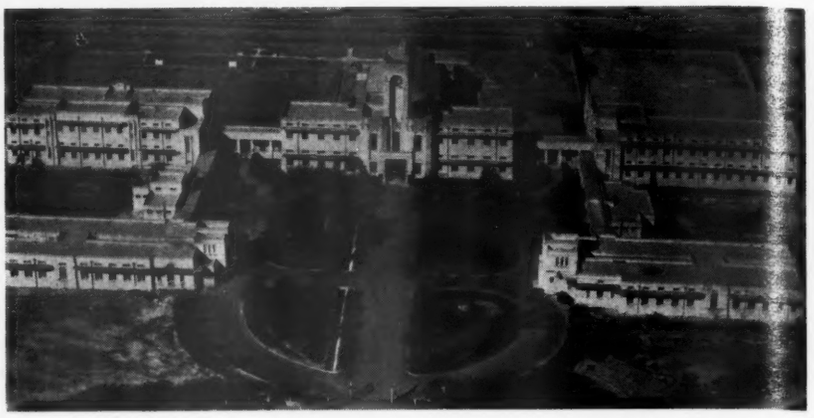
Thermal cracking plant.



vide the extra unsaturated $C_4$ for polymerization. This is carried out in a special plant, and the material after debutanization and redistillation is dispatched for shipment. Cyclohexane disrupts to a marked degree aviation spirit production in that the required fraction has to be abstracted by superfractionation from isoheptane, and, therefore the equipment employed for processing isoheptane has to be switched over to this particular operation. Much the same reasoning applies to the manufacture of toluene, ethyl benzene, and the xylenes.

In the ultimate analysis the throughput of the refinery and production of different fractions all call for control according to a set schedule of offtake. The storage capacity available for each type of product plays a part in determining the throughputs to be run. The tank farm, receiving, storage, and loading facilities match in a broad way with production rates and the arrival of tankers, and are capable of receiving and loading approximately 2,000,000 long tons of products a month. Storage for finished products at Abadan is rather large because of the remote situation of the refinery from the main distribution centers, and the "bunched" arrival of tankers. The simultaneous arrival of several tankers demands high stocks to prevent delays in shipment, and likewise non-arrival or delayed arrival of ships requires adequate tankage to take care of production during the period of low offtake. The storage capacity at Abadan for black oils is equivalent to 6 weeks' production and 8 weeks for white oils.

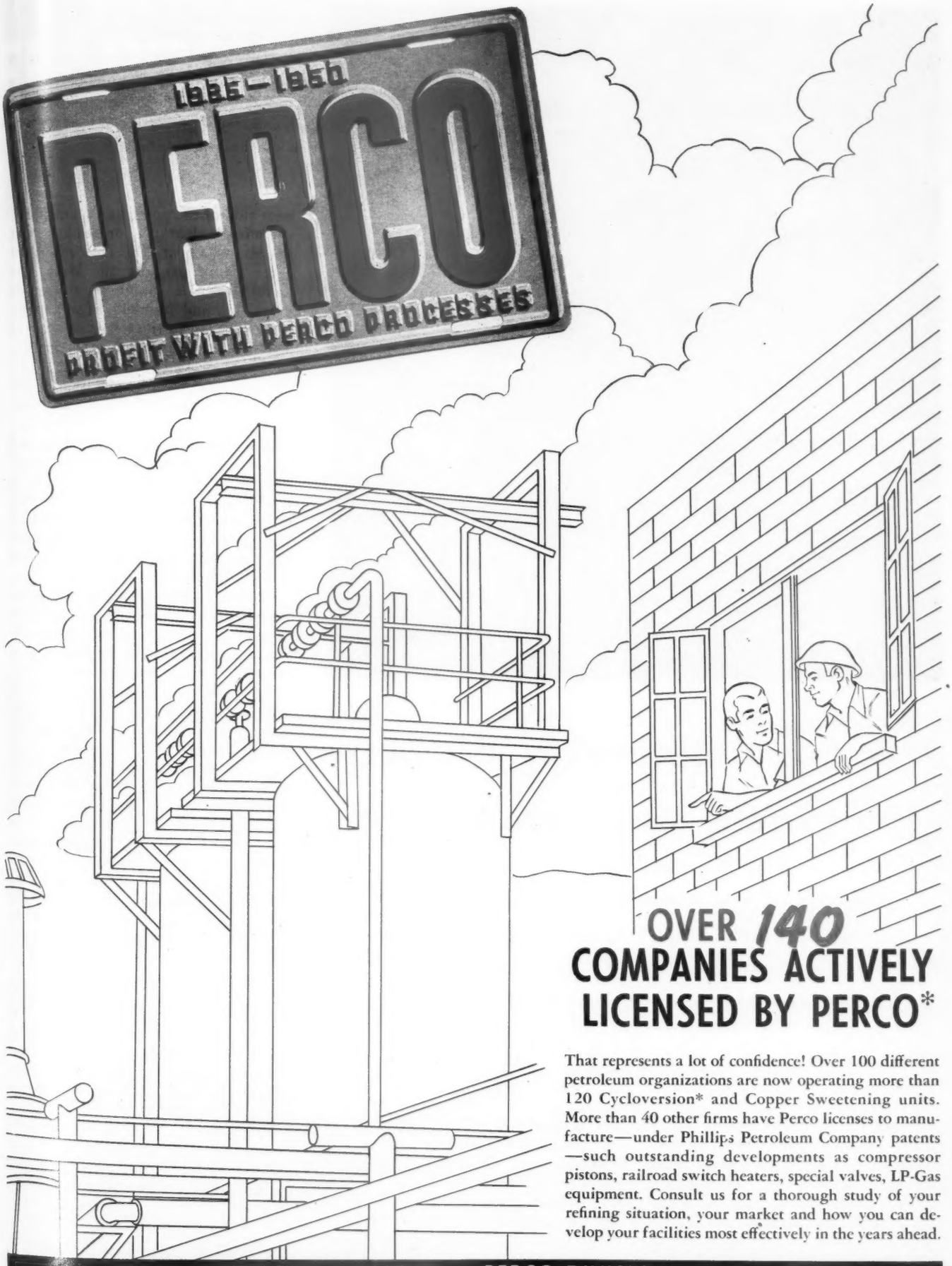
In the distillation units forming the basic process the Abadan refinery is exceptionally well instrumented. On refining units 4 hourly tests for acidity of the product are made. The more complex units, such as alkylation and $SO_2$ extraction plants, have small laboratories attached to them, where a chemist is on duty throughout each shift to test the products. In the refining area there is a local laboratory. Products from the distillation side are all sent to the central laboratory for testing. There is a planning department to insure integration of organization of inspection and maintenance with processing. The time efficiencies of the main process plants are approximately 85 per cent on crude distillation units, and 75 per cent on reforming units. It is expected that as a result of the new inspection code whereby periodic inspections are made at 4 yearly intervals the time efficiencies on distillation units will be raised. The inspection department is responsible for keeping up-to-date records of all vessels, tubulars, furnace tubes, etc. A card index system is in use, and at each inspection details are entered in the appropriate record card of the condition of each individual item of plant inspected together with information on repairs and/or modifications carried out. By this means wear rates are calculated and the probable life of various plant items predicted so that overhauls can be planned in detail, and the maximum use made of such time-saving devices are prefabrication. Maintenance reports are standardized for all overhauls, and include a graph showing the planned and actual times taken for the overhaul on a percentage basis, repair list, man power employed, supervision required, deviation from plan, technical report on the work done, and minutes of post-overhaul meeting held to discuss the performance of overhaul crews. Standardization is practiced as far as possible on such plant items as pumps, motor compressors, turbines, tubulars, acid eggs, balance tanks, etc., and those in charge of the refinery are steadily moving more and more towards standardization as a real labor-saving and cost-cutting device.



The Technical Institute.

Among chemicals manufactured at Abadan are some 800 tons of caustic soda a month, to be made up into soda solution, sodium plumbite for doctor sweetening, and preparation of bleach solution by leaching imported calcium hypochlorite. Production of sulfur from the gases in the fields area is carried on continuously, as it is in Abadan utilizing $H_2S$-bearing refinery gases. These along with acid-recovery plants make the refinery practically self-supporting as regards sulfur supplies. The sulfur is needed in the manufacture of sulfuric acid using modern contact plants employing vanadium-oxide catalyst, the capacity of these plants totals some 300 tons per day. Liquid-$SO_2$-manufacturing capacity of the order of 14 tons per day is also available to furnish $SO_2$ for the solvent-extraction processes. Inasmuch as the Abadan refinery is so far from other industrial areas with a background of technical organization and assistance provision has been made for adequate engineering stores carrying spare parts, and workshops are run effectively to insure continuity of operations.

The Abadan power station, with a generating capacity of nearly 80,000 kw, supplies power to the refinery, and the housing estates of both staff and labour. Steam is supplied to both generating sets, process plants, and water-pumping units by 3 boiler batteries with an installed capacity of close on 4.5 million pounds per hour. This capacity allows adequate standby for cleaning and overhauling boilers and auxiliaries. Only the butenes and the pentanes from the cracking units are used as feedstock for the alkylation units. The $C_2$ and $C_3$ fractionators are at present combined to augment the supply of the gaseous fuel. The refinery water supply is pumped from the Shat-el-Arab river, and is further augmented by 4 water-cooling towers, giving a total water pumping capacity of over 25,000,000 Imperial gallons per hour. The power station has a segregated water supply, which is cross-connected on to the main water system. Compressed air at 100 psi is supplied by centrally located turbo-compressors. This supply is mainly available for driving pneumatic tools. Lower pressures supplies of air are available for the manufacture of blown grades of bitumen. * * *




# OVER 140 COMPANIES ACTIVELY LICENSED BY PERCO*

That represents a lot of confidence! Over 100 different petroleum organizations are now operating more than 120 Cycloversion* and Copper Sweetening units. More than 40 other firms have Perco licenses to manufacture—under Phillips Petroleum Company patents—such outstanding developments as compressor pistons, railroad switch heaters, special valves, LP-Gas equipment. Consult us for a thorough study of your refining situation, your market and how you can develop your facilities most effectively in the years ahead.

A SERVICE MARK

PERCO DIVISION
PHILLIPS PETROLEUM COMPANY
BARTLESVILLE, OKLAHOMA

Phillips 66

Impressive aspect of crude distillation unit illuminated by powerful electric lights which permits keeping the plant in operation day and night. The installation produces propane, light gasoline, naphthas, gas oil, and combustion oil.

# Modern Refinery in Western Venezuela Goes on Stream

*Atmospheric and vacuum distillation units, two thermal crackers, reformer, and various chemical treating units comprise the new Cardon plant of the Shell interests on the Paraguana Peninsula*

H. C. PLUMMER

SPURRED by steadily mounting industrial developments throughout the Republic of Venezuela in recent years and the prospect of forthcoming smelting operations to draw upon the rich iron ore deposits now entering upon production there, far-reaching expansion and construction programs are being undertaken by the major American and foreign petroleum companies in that country. Among the latest of those is the 55,000-bbl refinery of the Shell Petroleum Company on the Paraguana Peninsula of the State of Coro, in Western Venezuela, adjacent to Maracaibo Lake.

The new plants, which are centered in an extensive colonization layout, with upward of 1500 dwellings for staff and workmen, occupy a plot of 1275 hectares (1 hectare = 2.47 acres), fronting on the Caribbean Sea on the west side of the peninsula named. The site affords clearance for shallow-draft vessels, which are the only means of egress from neighboring Maracaibo Lake, undersea source of the crude petroleum and for deep draft oil carriers engaged in the transportation of petroleum and petroleum products to overseas exports markets and to domestic consumption centers reached along the extensive Venezulean coastline.

The area of Shell's new refining and processing operations is on two trunk-line scheduled air-transport services centering at the City of Coro, capital of the State of the same name of which the peninsula is a coastal extension. They are the Maracaibo-Coro routes and the Maiquetia*-Coro route.

Among the industrial users of petroleum within Venezuela are numbers of manufacturing and processing operations, which have sprung up to serve the the widening scope of petroleum production and the gigantic mining, community-building, transportation and port developments of the United States Steel Corporation and the Bethlehem Steel Corporation, whose Venezuelan affiliate units are, respectively, the Oliver Mining Company and the Iron Mines Company of Venezuela. A requisite condition of the forthcoming ore recovery and exportation to the United States will be the smelting on Venezuelan terrain of a percentage of the mineral produced in the Orinoco Delta salient. Their highway and railway development will be on a scale commensurate with the mining and shipping operations, which latter are to employ 45,000-ton and 26,000-ton ore-carriers for transit of the iron to Mobile, Alabama and Philadelphia, in one instance, and to Sparrow's Point (Baltimore), Maryland, in the other.

The State of Coro, at the opposite end of the republic from the iron-ore areas, is shortly to come under the comprehensive system of highway construction, already appropriated for and blue-printed by the Junta Militar del Gobierno de Venezuela, now the ruling executive and administrative factor in the northernmost of South

*Maiquetia is now the "key" airport for air traffic into and out of the Federal District, which comprises Caracas, the national capital, and La Guaira, the chief seaport.

EXCLUSIVE

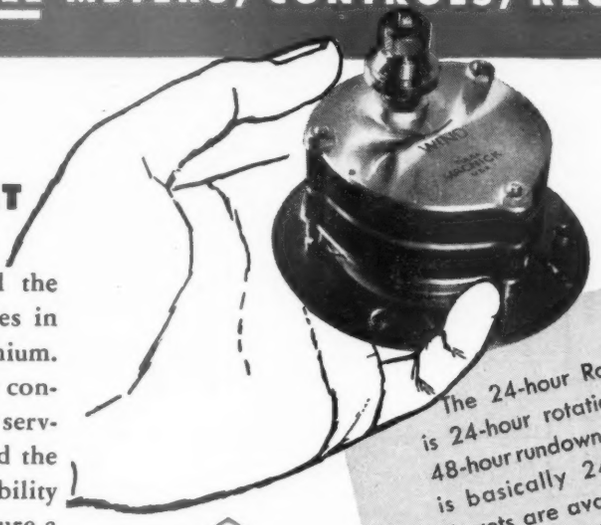
IN TIME WITH THE TIMES . . .

# NEW ROCKWELL CHART DRIVES

## FOR ALL METERS, CONTROLS, RECORDERS

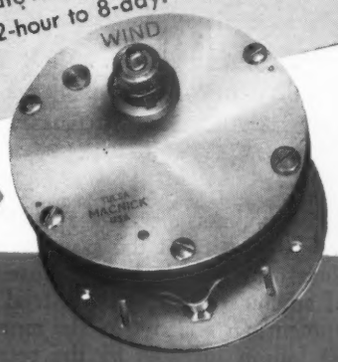
### THE *MIGHTY* MIDGET

Rockwell Midget chart drives fill the need for small size, powerful drives in instruments where space is at a premium. These drives are compact, strongly constructed and designed for years of service. In no other drive will be found the same combination of size, adaptability and quality. Rockwell Midgets feature a detachable escapement (sealed in transparent plastic). They wind through the chart arbor and snap mount into separate ring that may be positioned on bosses or adaptors to fit any instrument case.




24 HOUR MIDGET DRIVE

The 24-hour Rockwell Midget is 24-hour rotation only, with a 48-hour rundown. The 8-day drive is basically 24-hour rotation. Turrets are available to give ten alternate rotation speeds ranging from 2-hour to 8-day.




8 DAY MIDGET DRIVE

Illustrating how turrets lock onto the chart arbor to change rotation speeds. This same conversion convenience is obtainable on the 8-day Midget drive.

There are two basic models of the Standard type—24-hour rotation, 8-day wind; 7-day rotation, 31-day wind. A power drive is available for use where more than the usual amount of torque is required. Built as specified in rotations of 1, 2, 3, 4, 6, 8, 12 hours. Turrets provide a selection of 10 alternate speeds.

STANDARD TYPE with Speed-Lok chart hub

### THE *VERSATILE* STANDARD

Since the Rockwell Standard is thinner than most other drives, it may be readily used as a replacement in practically any instrument. This is accomplished by means of adaptors which correctly locate the drive both as to position and height.

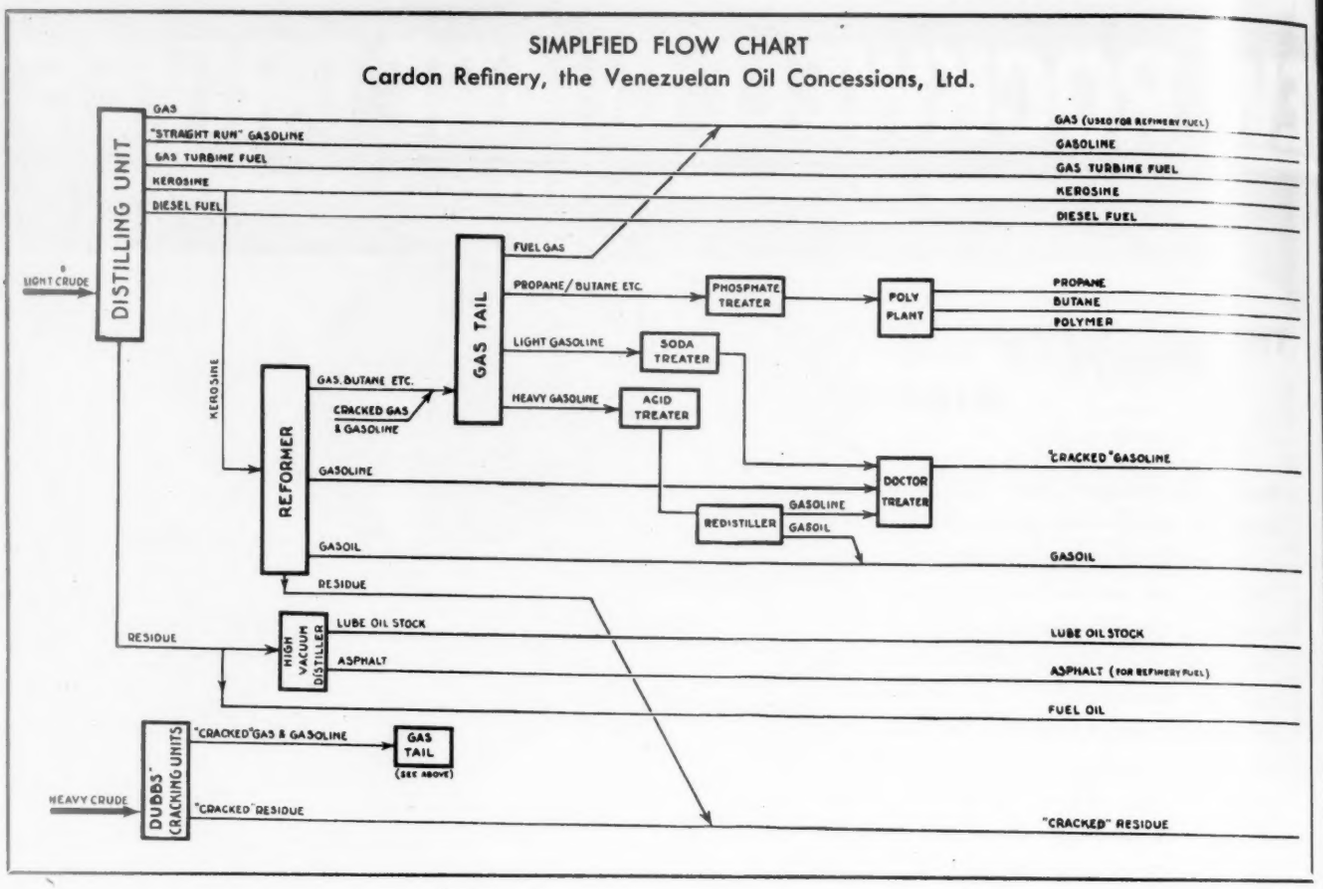
Rotation speeds present no problem either. Speed changing turrets lock into place on the chart arbor to provide the desired rotation cycle.

Such versatility in application makes the Rockwell Standard the most economical chart drive you can use. You'll save on inventory, in service and in reduced maintenance expense.

Attractive factory repair program — WRITE FOR BULLETIN NO. 1079

**ROCKWELL MANUFACTURING COMPANY**
Pittsburgh 8, Pa.

Atlanta Boston Chicago Columbus Houston Kansas City Los Angeles New York Pittsburgh San Francisco Seattle Tulsa

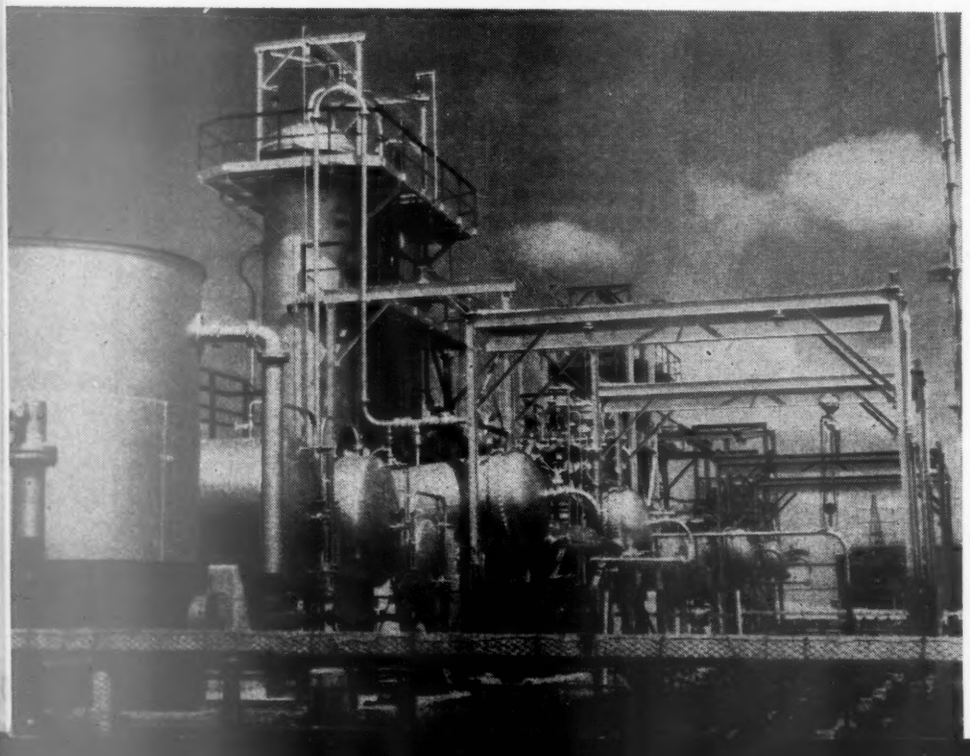



American nations. Venezuela, by the way, is well past the stage of transition from a land of agriculture to one of advanced modern industrial development. In addition to the more than $3 billion invested by the petroleum and steel interests in Venezuela, there are increasingly substantial commitments by other American and Canadian financial, mining, and non-mineral producing and servicing operators there.

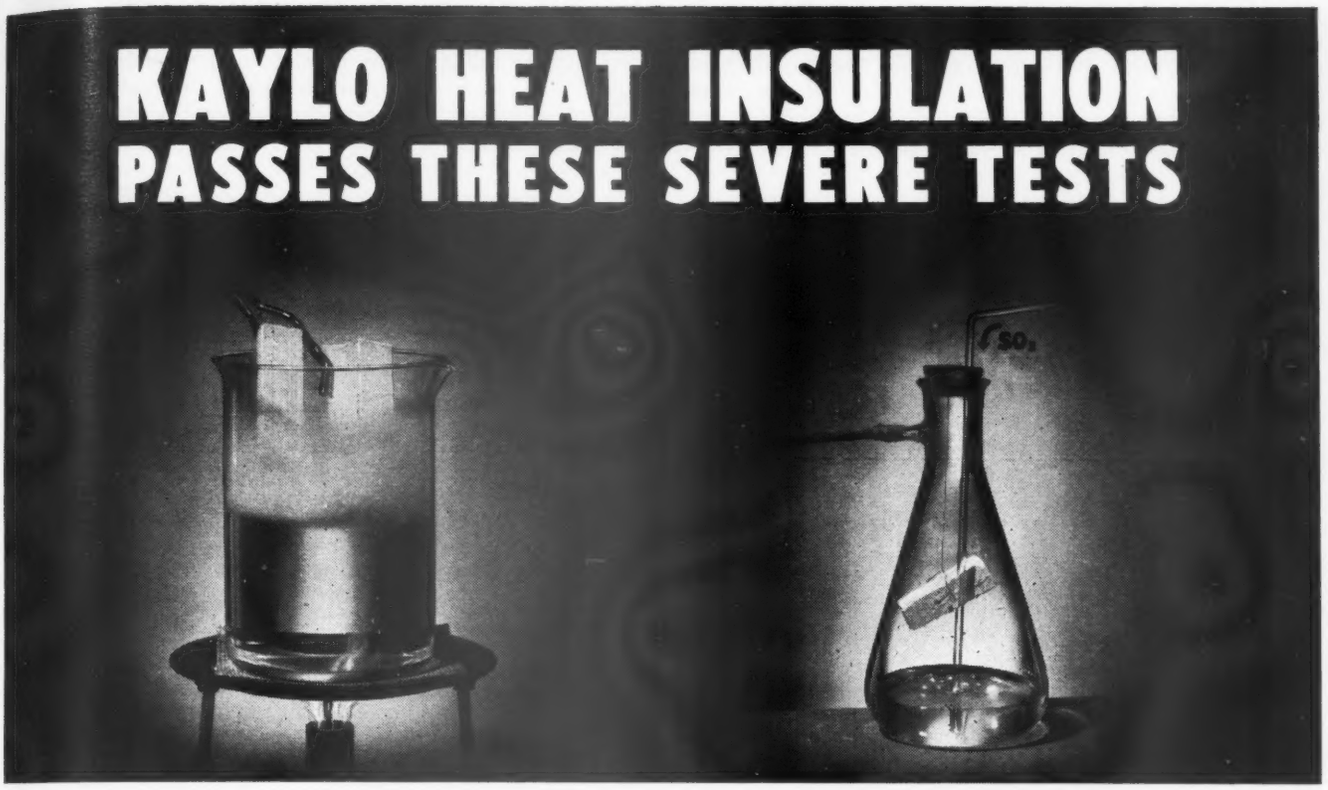
Conceived during the war years, and begun in 1945, construction of Shell's Cardon refinery suffered from all the manpower and materials difficulties of the immediate post-war period. In addition it was handicapped by the isolated desert-like conditions of the Paraguana Peninsula, on whose southwest corner it is located. Before real work could start, a temporary jetty had to be made for landing of materials, and facilities for the housing, feeding, and watering of labor and staff. Moreover, the final plans covered not only an extensive refinery but a complete city to house its projected 10,000 inhabitants (staff, labor and families) with all its attendant amenities of schools, churches, hospitals, clubs, restaurant, commissary, market, etc. Faced with the alternatives of temporary structures to house the construction force, with promise of a quicker get-away in the construction job, or of erecting only permanent buildings, with decreased final cost and better living conditions during the construction period. Shell chose the latter course, and while at times a school may have been used as a hospital, or dwellings as offices, etc., the final job was completed without a temporary building of any sort. Despite all these handicaps, progress under the forceful direction of the manager on the spot, C. P. Louwerse, was exceptionally rapid. The first party of six men landed in a rowboat on the barren coast in March, 1945, and the first plant, the crude distilling unit, went on stream in February, 1949.

The refinery is on a plot of 1275 hectares with a coastal frontage of

Acid treating plant at Shell's Cardon refinery.



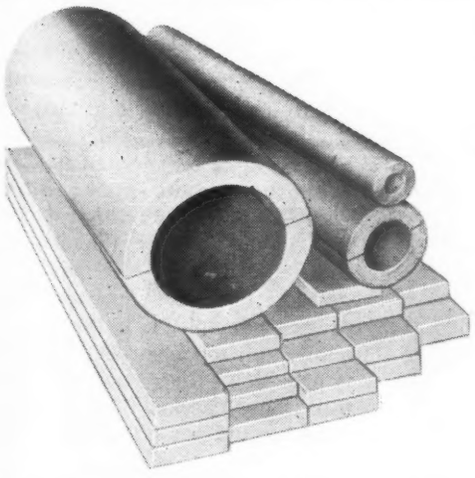
# KAYLO HEAT INSULATION PASSES THESE SEVERE TESTS




**BOILING TEST:** Samples of Kaylo Heat Insulation have been boiled continuously for 24 hours and longer. None disintegrated or showed any loss of insulating efficiency after drying.

**FUME TEST:** Samples of Kaylo Heat Insulation were suspended in an aerated mixture of water vapor and $SO_2$. The Kaylo samples showed no deterioration after weeks of direct exposure.

## One Material Insulates Efficiently up to 1200°F.



Kaylo Heat Insulation is made of hydrous calcium silicate (not glass), a remarkable material with high insulating efficiency up to 1200°F. This new type of inorganic insulating material retains its stability in long service under severe conditions. Exceptional strength and lighter weight make it easier to handle and apply.

**KAYLO PIPE INSULATION** is produced in Simplified Dimensional Standards of thicknesses and diameters for pipe sizes from ½" to 72". Coverings are sectional for sizes ½" to 12"; tri-segmental for 8" to 23"; quad-segmental for 19" to 41"; K-segmental (18" sections) for 38" to 72". O.D.'s of insulation correspond to O.D.'s of standard pipes.

**KAYLO HEAT INSULATING BLOCK** is available for single layer application in thicknesses from 1" to 6". It is made in all standard sizes up to 18" x 36".

# KAYLO®

## PIPE INSULATION AND HEAT INSULATING BLOCK

**OWENS-ILLINOIS GLASS COMPANY**
**Kaylo Division • Toledo 1, Ohio**

**SALES OFFICES:**
Atlanta · Boston · Buffalo · Chicago · Cincinnati · Houston · Minneapolis · New York
Oklahoma City · Philadelphia · Pittsburgh · St. Louis · Toledo · Washington

**SEND COUPON FOR KAYLO HEAT INSULATION LITERATURE**

**OWENS-ILLINOIS GLASS COMPANY**
**Dept. N-111, Kaylo Division • Toledo 1, Ohio**

Gentlemen: Please send me descriptive literature on Kaylo Heat Insulation.

NAME.....

FIRM.....

ADDRESS.....

CITY.....STATE.....

some four miles, facing deep water to the west. With the prevailing wind coming strongly from the northeast almost the whole year round, this sheltered deep water anchorage was the determining factor governing the choice of this site for the refinery. It is built to handle crude oils produced by Shell in the area surrounding Lake Maracaibo, to which access by ocean vessels is blocked by the restrictions of the shallow Maracaibo Bar.

As shown on the refinery plot plan, the plant area itself, including jetties, plant facilities, tank farms, office, and laboratory, is laid out in the southern half of the lot, leaving the northern part for the residential, social, and shopping area. The two parts are separated by a strip of open ground.

Two very strong reinforced concrete oil jetties were among the first technical facilities constructed as they served equally well for freighters and facilitated rapid landing of materials. These jetties are designed to provide four berths for shallow draft lake vessels and four berths for ocean tankers. The jetties are 1250 ft long, the draft at the end being 47 ft. All lines are carried below the monolithic concrete decking of the platforms in a very clean and efficient design.

### Process Scheme

A general process scheme of the Cardon refinery is attached, showing also the basic refinery units, which are briefly described as follows:

The distilling unit is designed for 38,000 bbl a day, 34 API gravity crude intake. For refinery and export crude a storage capacity of approximately 1,200,000 bbl is provided. The unit consists of a primary column, a secondary or vacuum column, a gasoline rerun column, and a stabilizer. The primary and secondary columns are provided with side-cut strippers to obtain the desired fractions. The end products of this unit are gas for refinery fuel, straight run gasoline, naphtha, kerosine, gas-oil, and residual fuel.

The bottom product of the secondary column, which is a long residue, is redistilled in a high vacuum tower provided with side-cut strippers to produce basic lubricating stocks and short residue. To be able to handle feedstocks, containing naphthenic acid, the unit is equipped with a caustic extraction system.

The cracking units, comprising two identical thermal cracking units, were built with a capacity of about 11,000 bbl a day each for processing a heavy 13 API crude, converting this crude oil into gasoline, gas-oil, and a bunker fuel oil. Besides customary reaction and high pressure flash chambers, the units are also provided with a low pressure flash chamber, operating at about 5 psi, allowing an extremely deep flash of the cracked residue. The flashed distillate is recycled via the fractionating tower through to the cracking furnace. The lightest fractions are charged to a gas recovery unit together with similar fractions from the reformer.

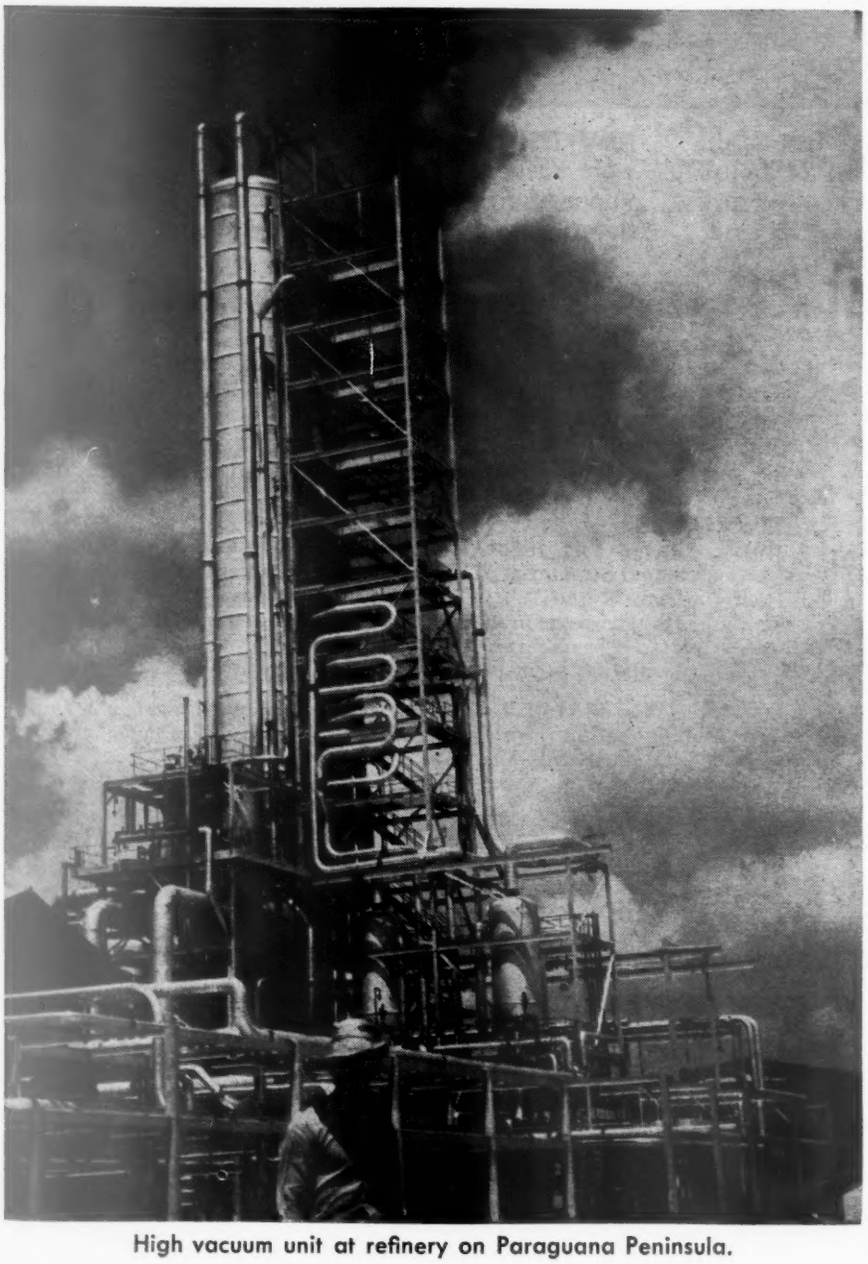
The reforming unit is a conventional UOP type reformer, upgrading a low octane S.R. naphtha into a marketable motor gasoline component.

The gas recovery unit consists of a rectifying absorber and stripper and a gasoline splitter. A dry gas, mainly consisting of ethane and lighter components, is produced as absorber top gas. The absorber bottom is debutanized in the stripper, the stripper bottom being further fractionated in the gasoline splitter. The heavy gasoline or gasoline splitter bottom is used as lean oil for the absorber. The absorber is provided with a small section at the top where cracked gas oil from the cracking units is circulated as sponge oil.

There are four treating units, namely, phosphate, soda, acid, and a doctor treater.

The Shell phosphate process is applied for treating of the C3-C4 fraction from the cracking and reforming units to remove $H_2S$. The so-treated fraction is subsequently scrubbed with caustic to remove mercaptans, prior to being charged to the poly unit.

In the soda or light tops treater cracked and reformed tops are treated countercurrently for removal of $H_2S$ and mercaptans after being given a prewash with salt water. The unit is of the continuous mixing-settling type.



High vacuum unit at refinery on Paraguana Peninsula.

# Are you making the most of BECKMAN pH METERS in your refining operations?

THE BECKMAN MODEL H-2 pH METER is one of a complete range of Beckman pH Meters available for every type of application*. The H-2 is particularly recommended for applications where high accuracy and simple operation—combined with the convenience and low cost of 115-v. AC operation—are desired.

It provides instant and direct pH readings, and a simple, built-in dial permits quick, convenient temperature compensation over the entire range of 0° to 100°C (32° to 212° F.). High reading accuracy is assured by wide-spread dual range scale that reads from 0 to 8 pH or from 6 to 14 pH at the turn of a switch. Same switch also provides instant millivolt readings from 0 to ±800 mv and from ±600 to ±1400 mv for titrations and oxidation-reduction measurements.

Built-in electrode support and compact case design save valuable space and permit easy portability to various plant locations.

**Particularly important is the wide range of factory-sealed, maintenance-free Beckman Glass Electrodes available for use with this instrument . . . electrodes that are virtually unbreakable . . . that cover extreme temperature ranges from below freezing to above boiling . . . that have an unprecedented pH range with negligible errors . . . that are abrasion-resistant and chemically durable to a degree never before thought possible in glass electrodes.*

*In addition to the H-2 Meter, other Beckman pH equipment includes completely automatic pH indication and control instruments for large-scale process applications . . . battery-operated models for complete portability in plant and field use . . . and a laboratory type instrument that features maximum versatility and accuracy for research and laboratory applications

*Five ways to improve refinery operations with Beckman pH Control*

Leading refineries are using Beckman pH Control for many profitable applications that save time and money, reduce maintenance and increase plant efficiency. Whether yours is a small or large refinery, we suggest that you investigate the savings to be made by such typical applications as these . . .

1. **NEUTRALIZING CRUDE STOCK ACIDITIES** *to prevent damage and corrosion to costly equipment.*
2. **MAINTAINING CONSTANT COOLING WATER CHECK** *for immediate detection of hidden leaks in lines and equipment.*
3. **NEUTRALIZING ACIDS IN STILLS** *to assure a uniform acid-free product.*
4. **TREATING PROCESS AND BOILER FEED WATER** *to assure soft, neutral water, greater freedom from liming and boiler maintenance, and substantial savings in chemicals.*
5. **RELIABLE CONTROL OF WASTE DISPOSAL** *with better neutralization of acid and caustic effluents . . . at lower chemical costs.*

These are only typical of the many money-saving ways modern refineries are using Beckman pH Control. See your nearest authorized Beckman dealer for more details on these and other refinery applications—or write direct.

**BECKMAN INSTRUMENTS**
control modern industries

**Beckman Instruments, National Technical Laboratories**
**South Pasadena 26, Calif.**

***Factory Service Branches:***
**NEW YORK • CHICAGO • LOS ANGELES**

**Beckman Instruments: pH Meters and Electrodes — Spectrophotometers — Radioactivity Meters — Special Instruments**

The acid treater consists of two identical units for the sulfuric acid treating of heavy cracked gasoline in a countercurrent two-stage mixing-settling type plant.

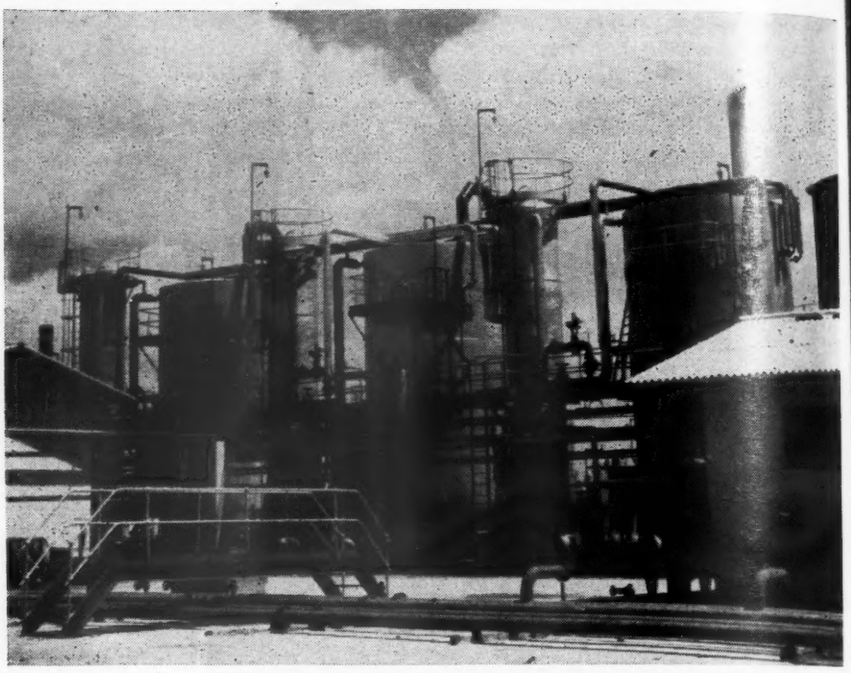
The doctor treater is a conventional 1850 M.T. a day continuous doctor treater for the treatment of light and heavy cracked and reformed gasolines. The spent doctor solution is regenerated in a three-stage recovery unit.

In the redistillation unit acid treated gasolines are redistilled to remove the polymers during the acid treatment.

In the polymerization unit the combined treated C3-C4 fractions, mentioned above, are catalytically polymerized and subsequently stabilized to yield a polymer gasoline suitable for blending in motor gasoline.

In addition to the foregoing units, all of which have been taken into operation, construction is now under way on a comprehensive luboil complex, comprising the following units for the manufacture of high-grade lubricating oils:

De-asphalting unit (capacity 2560 bbl a day); furfural extraction unit (capacity 6350 bbl a day); solvent dewaxing unit (capacity 3520 bbl a day); clay contacting unit (capacity 3700 bbl a day). It is expected that these units will be completed during the second half of 1951, turning out some 2000 to 2500 bbl a day high grade lubricating oils.



Doctor treating unit at Shell's refinery, Cardon, Venezuela.

### Utilities

To supply the Cardon refinery and its living area with electricity, fuel, steam, and salt and fresh water the following utilities have been erected:

*Steam Generation Plant.* The generator turbines of the power plant are driven by 500 psi steam, produced in 3 high pressure Babcock and Wilcox boilers each of a capacity of 50,000 kg per hour. Low pressure 250 psi steam, necessary as process steam in the various refinery processes, is produced by 4 low pressure boilers, each of a capacity of 45,000 kg per hour. Feed water for these boilers is lime-soda treated in a water softening plant and subsequently phosphate conditioned.

*Power Supply.* Practically all pumps and spares are electric driven and power is supplied by 4 English electric condensing turbines of a capacity of 10,000 hp, each one driving a generator alternator delivering 7500 kw. The electric supply for light and power is divided over 16 transformer stations.

*Water Supply.* This is two fold. Salt water is used as cooling and fire water; fresh water for chemical solutions, boiler feed water, and domestic water. After the erection of the luboil project it is expected that about 30,000 tons per hour of cooling water will be used in once-through operation, requiring no cooling towers. Presently there are two electric driven and two turbo driven centrifugal pumps each having a capacity of about 6000 tons per hour. One electric driven and two diesel driven pumps each of 500 tons per hour capacity are installed as fire pumps.

Fresh water has until recently been supplied by one Vickers-Armstrong salt water distiller of 1100 tons per day capacity and four Lummus salt water distillers of 150 tons per day each. From now on fresh water will be supplied through a joint Shell/Creole/Venezuelan Government 30 in. per 34 in. pipe line gravitating water over a distance of 80 miles from springs and wells near Coro on the mainland to Cardon as well as to Creole's Amua Bay Refinery.

Fuel supply will consist of refinery gas as well as a residual fuel, the latter being circulated at elevated temperature in a Peabody return system.

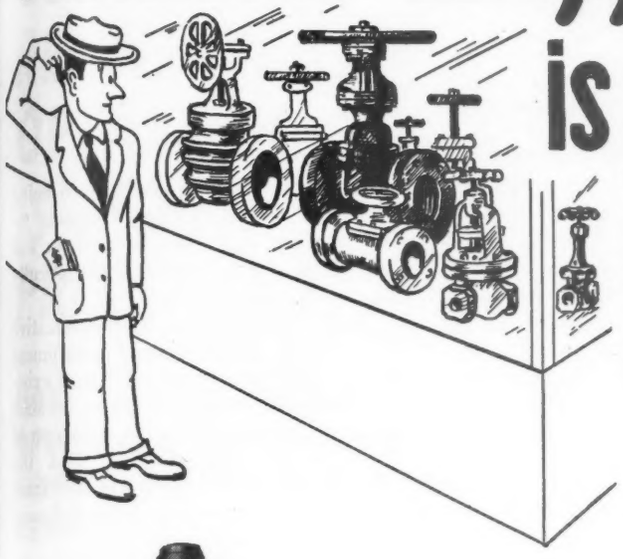
Most of the various refinery units described above were designed by the Lummus Company and UOP, and some were of Shell's own design. The major part of the refinery construction work was carried out by Lummus; Raymond Concrete Pile Company undertook the work on the jetties and most of the concrete work for the refinery area (foundations, pipe track, sleepers, etc.); most tankage has been erected by Whessoe Limited, and the balance of the work has been done directly by the Shell organization itself with the assistance of certain local Venezuelan contractors.

### Accommodations

The social side of construction covers the following main items: 257 houses for staff, comprising houses with 2 and 3 bedrooms, also accommodation for 46 bachelors; 1000 two and three-bedroom houses for workmen in the form of semi-detached units; 21 houses for workmen (bachelors) providing individual accommodation for 2 and 3 bachelors per house; two schools for Venezuelan children, of which one is at the moment in use as a temporary hospital; one school for children of foreign staff.

In addition there is a modern fully equipped clinic for handling all day patients, alongside which is planned an extensive modern hospital which represents the only permanent social facility of importance not yet constructed. In the meantime a school building is in use as a very efficient hospital. There is also a Roman Catholic and a Protestant Church, two clubs, cinema, a very extensive commissary building where articles are sold at controlled prices, a well equipped restaurant, beauty parlor, drug store, soda fountain, shops, etc. Principal industrial buildings are main office, laboratory, harbor office, warehouses, machine shops, etc. Cement blocks have been the basic construction material for housing and reinforced concrete for office, laboratory, and refinery units. * * *

# "Window Shopping" for Valves is poor economy



Reading advertisements is like "window shopping"—it's a good way to see what's on the market. But don't let it influence you into buying your flow control equipment from different sources.

Because if you buy all your valves from one source you avoid these pitfalls:

Complications in stocking spare valve parts.

Difficulties that confront the maintenance department in making repairs on a variety of valves.

The necessity of carrying a much larger stock of repair parts.

The chances of installing valves that are not backed by adequate engineering service.

By offering the *only* COMPLETE line of valves available to Industry today, Powell makes this possible. And if you consult Powell Engineers and select the right valve to suit each individual service, your flow control problems are ended.

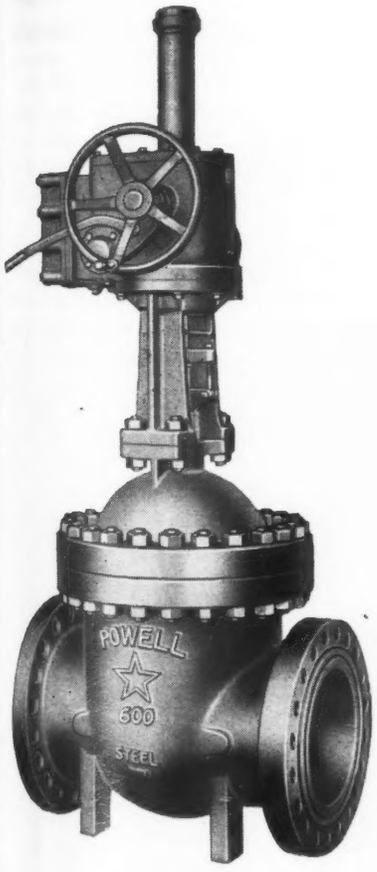



Fig. 6079 M.O.—Class 600-pound Cast Steel Gate Valve for Pipe Line Service. Has flanged ends and bolted flanged bonnet. Motor operated. Also available in Classes 150, 300, and 400 pounds.

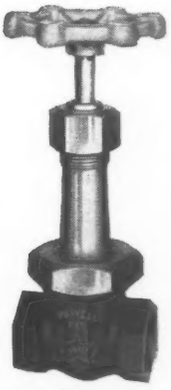


Fig. 375—200-pound Bronze Gate Valve. Screwed ends, union bonnet, inside screw rising stem and renewable "Powellium" wear-resisting nickel-bronze disc.

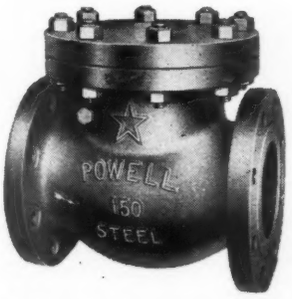



Fig. 1561—Class 150-pound Cast Steel Swing Check Valve with flanged ends and bolted cap.

Fig. 1793—Large 125-pound Iron Body Bronze Mounted Gate Valve with flanged ends, bolted flanged yoke, outside screw rising stem and tapered solid wedge. Also available in All Iron.

**The Complete Powell Line includes Globe, Angle, "Y", Gate, Check, Non-return, Relief and Flush Bottom Tank Valves in Bronze, Iron, Steel and a wide range of Corrosion-resistant metals and alloys.**

**Ask your nearest Distributor—or write direct**

**The WM. POWELL Co., 2525 Spring Grove Ave.**
**P. O. Box 106, Station B, Cincinnati 22, Ohio**
DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

**POWELL VALVES**

# Petroleum Refinery Instrumentation*

DOUGLAS M. CONSIDINE†

## In 3 Parts—Part 2

### Automatic Analytical Methods

Of late, automatic analytical methods have found their way into various phases of the petroleum industry. Many of these methods comprise complex apparatus for research analyses, such as the various spectrometers. Others comprise special equipment for routine analyses, such as the adsorption fractionators and certain automatic distillation columns. Still others comprise specific devices for the determination of various physical and chemical qualities.

Several of these analytical devices, which are extensively used in research and quality control laboratories, have their counterparts as actual process control mediums. For example, infrared and ultraviolet spectrometers, used for quantitative and qualitative determinations in the manufacture of high octane gasoline and butadiene for quality control, are also used, in modified form, for continuous analysis and sometimes to control process streams.

Another example illustrating the trend towards automatic analytical methods and one which has opened new vistas for tower control is the refractometer which continuously measures the refractive index of a flowing fluid. Formerly, measurement of refractive index was confined to the laboratory and to manual determination by visual means. Hence, such methods were not conducive to process control. With the advent of a means for continuously measuring the refractive index, a possible solution to many difficult distillation control problems became manifest. To cite an example—in the separation of styrene from its parent material by fractional distillation, separation by conventional temperature control is difficult and often unreliable due to the proximity of the boiling points of parent and product materials. However, since the refractive indexes of the materials are widely separated, control by this means is exceedingly effective. In actual production, control is obtained by maintaining a constant steam pressure on the reboiler and automatically regulating the reflux rate by means of the refractometer.

Many of the physical and chemical qualities, such as infrared absorption spectras, turbidity, color, etc., which yesterday were limited to manual methods of analysis, today are being analyzed automatically. Probably tomorrow the imaginative engineer will use these variables to automatically control his process.

Time does not permit an exhaustive description of available equipment for various analytical work and existing or possible control bases on such analyses. However, some concept of the possibilities afforded, and the trend in this field can be gleaned from the various devices which I shall now briefly describe.

Probably the largest single classification of automatic analyzers associated with the petroleum industry comprises the spectrometer. This includes principally the Raman, the mass, visible, infrared, and ultraviolet spectrometers, all of which have their specific uses and advantages.

Raman spectrometers, such as the Lane Wells apparatus shown in Fig. 7, provide a technique for revealing basic information concerning the molecular structures of compounds and also for both the qualitative and quantitative analysis of mixtures. Many inorganic and most organic compounds manifest characteristic Raman spectra. As, for example, all hydrocarbons reveal characteristic spectra as a result of the difference in the frequency with which

*Presented at the thirty-eighth annual meeting of the Western Petroleum Refiners Association, San Antonio, Texas, March 27-29, 1950.

†Manager of Market Extension, Industrial Division, Minneapolis-Honeywell Regulator Company, Philadelphia, Pennsylvania.

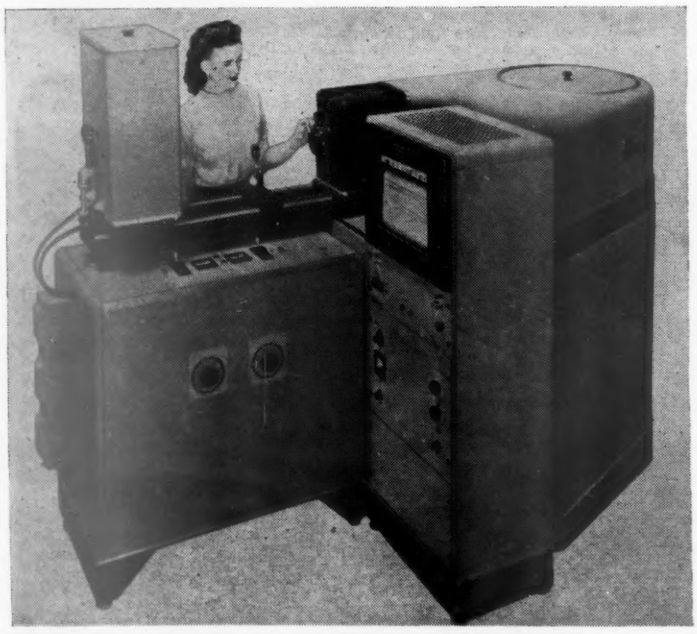


FIG. 7. Recording Raman spectrometer (Lane-Wells).

FIG. 8. Recording mass spectrometer (General Electric).

# CONTINUOUS REFINERY OPERATION IS MORE PROFITABLE

**MORE TIME ON STREAM**
**OPERATIONS ACCORDING TO PLAN**
**FEWER UNSCHEDULED SHUT DOWNS**
**REDUCED REPAIR AND MAINTENANCE COSTS**

these advantages all add up to
CONTINUOUS OPERATIONS

**Assure them for your refinery—**

## SPECIFY

# TRET-O-LITE

## CHEMICAL DESALTING

...helps refiners to maintain a continuous schedule of operations by preventing frequent shut-downs due to salt plugging and hard coking, and by helping to curtail corrosion damage. Many leading refiners rely on Tret-O-lite for efficient salt removal—for complete information, write or call

**COMPLETE DESALTING**
*Service*
**ENGINEERING DESIGN**
**LABORATORY TESTING**
**CONSULTATION**

## TRETOLITE COMPANY

*Manufacturing Chemists*

ST. LOUIS 19, MISSOURI

DESALTING | DEHYDRATING

FIG. 9. Recording infrared spectometer (Perkin-Elmer).

their atomic groupings vibrate and rotate. Thus, the kind of atoms present, their arrangement within the molecule, and the type of interatomic linkages are all factors which can be determined with the Raman spectrometer. At present, Raman equipment automatically produces a recorded analysis of the characteristic Raman spectrum as a sample. Although in the realm of possibility, no control applications have been forthcoming as yet for this kind of equipment.

Mass spectrometers, such as the General Electric shown in Fig. 8, provide a means for rapidly and precisely determining chemical composition of materials in the gaseous state, and frequently in liquid or solid form. The principle is separation of the molecules of a sample according to their mass.

The apparatus facilitates the analysis of light hydrocarbon streams, such as overheads and bottoms of depropanizers and debutanizers, and some of the heavier and more complex hydrocarbons. A typical depropanizer overhead analysis resolves normal butane, iso-butane, propane, ethane, and methane. Thus an analysis by mass separation aids in setting up a distillation column for maximum yield, aids in determining strategic tray locations, and reflux ratios. At present, the mass spectrometer functions as an analytical tool for qualitative and quantitative determinations in production and research laboratories and as yet has no modified versions for use as a direct process control element.

Infrared and ultraviolet spectromecters constitute typical examples of analytical apparatus that have modified counterparts for process control service. The Perkin-Elmer recording infrared spectrometer (shown at right, Fig. 9), the Beckman infrared spectrometer (left, Fig. 9), and similar equipment provide a recorded evaluation of infrared absorption at various wave lengths from which both quantitative and qualitative determinations can be made.

On the other hand, this Baird infrared analyzer (Fig. 10) provides a continuous recorded evaluation of infrared absorption at any one particular wave length from which a continuous quantitative determination of concentration can be obtained. It is evident that this latter unit is readily applicable to process control where it may be used to regulate the concentration of one liquid or gas in a mixture. In a like manner, the Beckman ultraviolet spectrometer is used to control the concentration of certain ingredients in a process stream.

Since practically all substances exhibit characteristic infrared absorption spectra, the use of these two spectrometers has large potential.

Essentially, the difference between the laboratory version of the infrared analyzer and its process control counterpart is one of construction. The laboratory analyzer is equipped with mechanisms for scanning and recording the entire spectrums as well as recording simultaneously, the amount of absorption at each frequency scanned. The analyzer for process control is designed to be sensitive to one

FIG. 10. Infrared spectometer for recording one particular wave lenath (Baird).

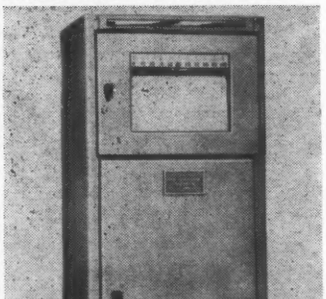
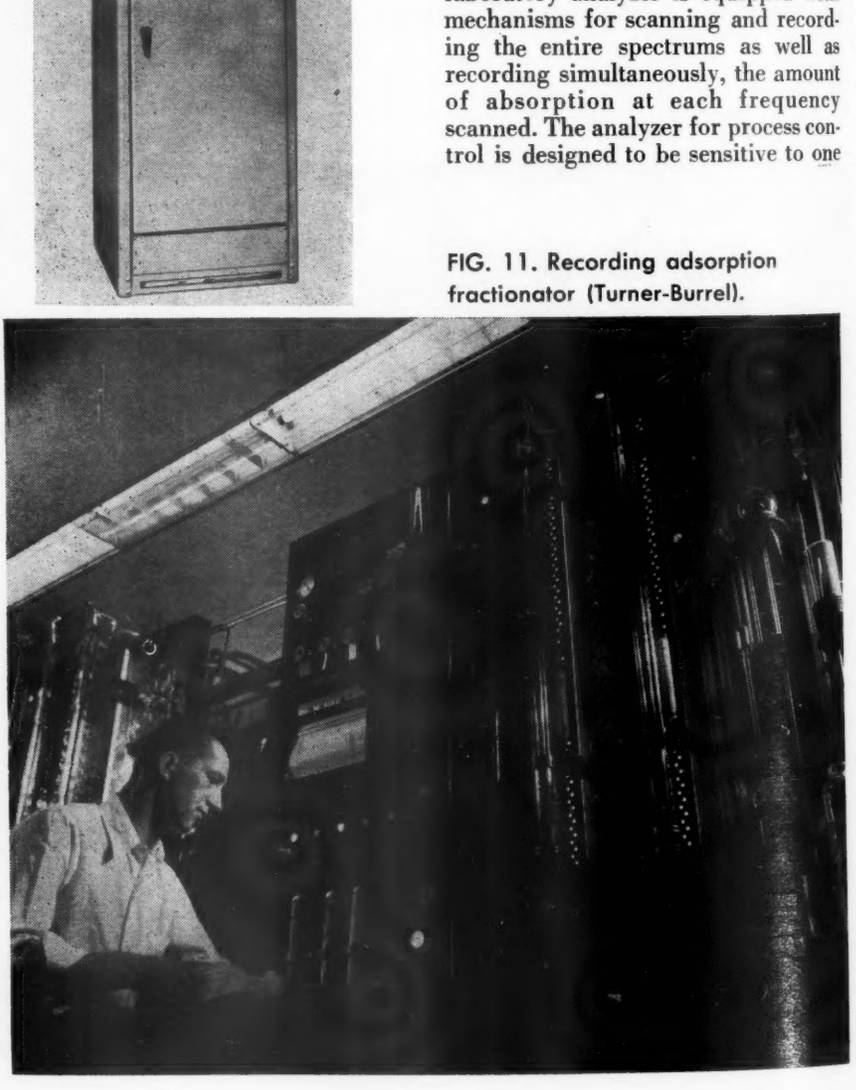


FIG. 11. Recording adsorption fractionator (Turner-Burrel).



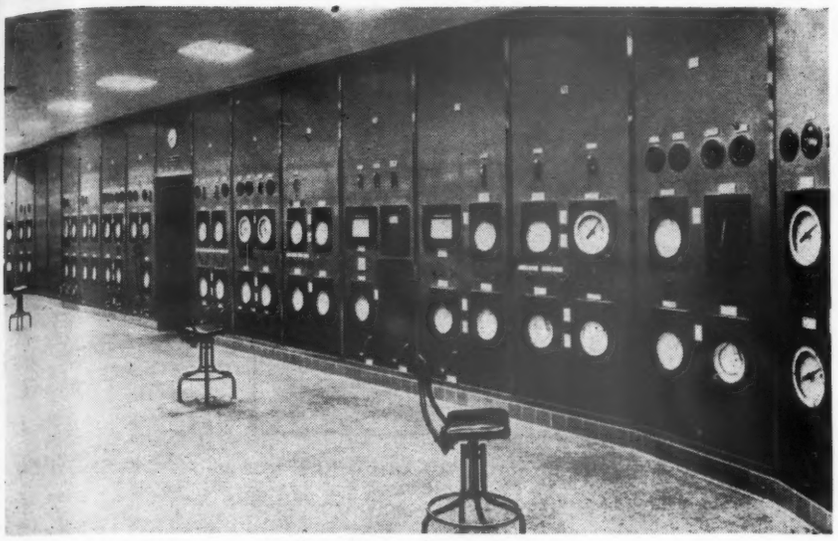


FIG. 12. Conventional centralized control panel.

particular frequency—that frequency at which the substance under analysis manifests absorption. Thus, the analyzer is sensitive to but one substance and by evaluating the amount of radiation at one frequency which passes through a sample containing the substance, the analyzer is enabled to continuously determine quantitatively the concentration of that substance in the sample. With this as a basis, it is but a short step to employ this method of sensing changes to the control of concentration of various ingredients in a plant stream.

Peculiar to the petroleum industry is equipment, such as the Turner-Burrell adsorption fractionator, which is used to facilitate the analysis of cracked and straight refinery gases, mixed fuel and natural gases, and pure fractions. The analyzer comprises the equipment necessary to separate, identify, measure, and collect the components of light hydrocarbon gas mixtures, and to record the analytical data obtained.

In similar vein, the Podbielniak automatic, low-temperature distillation analyzer shown in Fig. 11, provides an effective means of analyzing organic compounds, especially the hydrocarbons encountered in the petroleum industry. In effect, the analyzer acts as a mechanical totalizer of all column responses and produces a complete, accurate recording of low temperature fractional distillation analyses.

While the field of automatic analysis and control of process streams is only in its very earliest stages, it bears watching.

Fig. 12 shows the type of panel we are normally accustomed to visualize when thinking of centralized process control in the average refinery.

### Graphic Panels

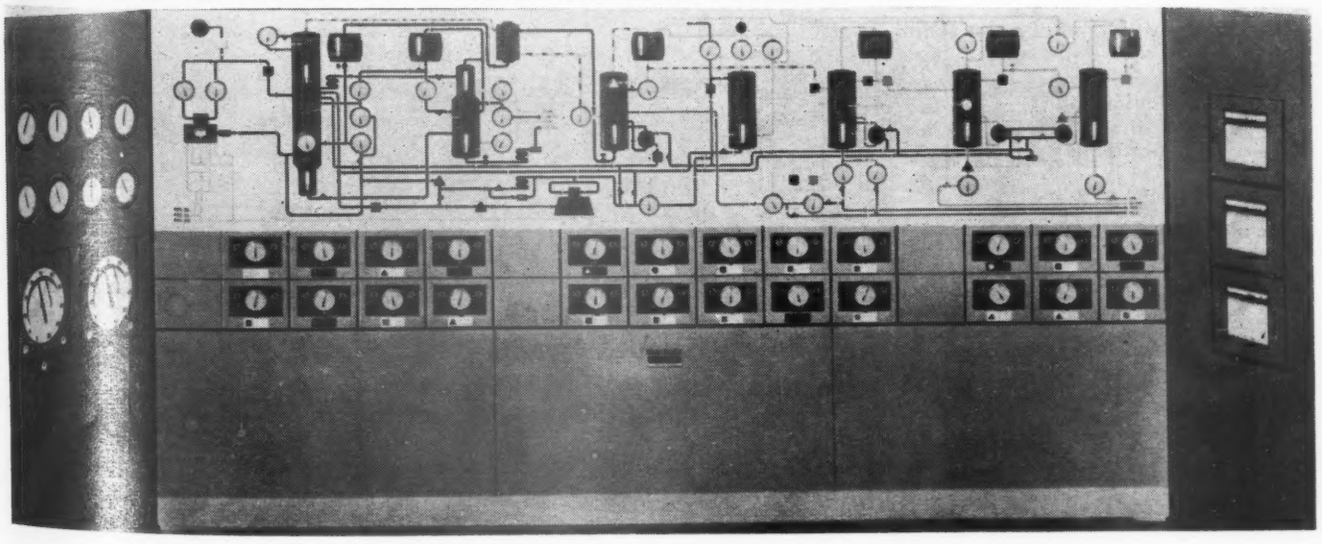
Fig. 13 is a graphic panel. We must admit that there is considerable appearance contrast between this and the conventional panels shown. Of course, where conventional panels are done in color, the contrast, while still striking, is not quite so apparent as it would seem by comparing these slides.

Although the graphic panel gives the central instrument control room in a processing plant a "new look", the fundamental principles of instrumentation required to achieve a panel of this type have been known and practiced in a somewhat different form for several years. Actually, the graphic panel simply is the result of applying an *artistic dress* to remote automatic control.

Unless carefully engineered, however, the exceptionally fine control which has been enjoyed by the petroleum refiner, as a result of years of instrument development, can be lost in developing the artistic and graphic idea. The petroleum refinery superintendent and his instrumentation engineer will do well to reflect seriously on the fact that good control and ample collection of pertinent operating data are the principal objects of process instrumentation and that he must not be swayed to sacrifice these advantages simply in the interest of obtaining a novel panel.

I shall attempt to point out how the advantages of conventional instrumentation can be coupled with the graphic idea to obtain a panel that is superior in many respects. While not practical and economical for all processes, these new concepts in instrument panel-

FIG. 13. New Color-Grafic panel with wing for mounting recording instruments.



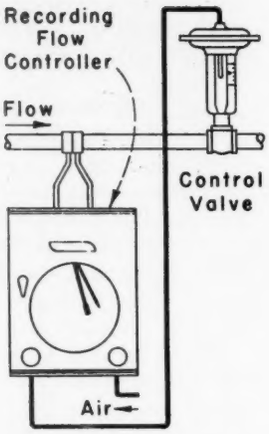



FIG. 14. Locally mounted flow meter with pneumatic control.

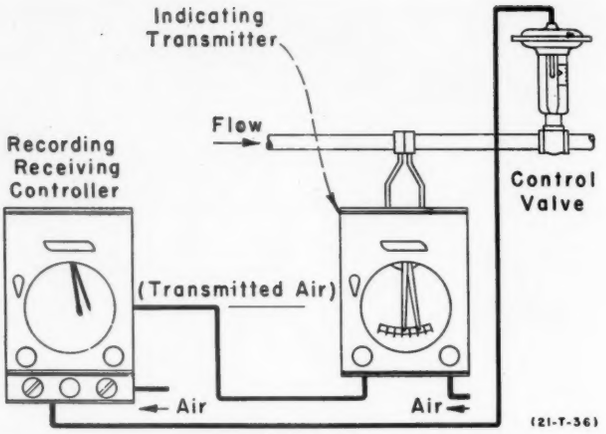



FIG. 15. Locally mounted indicating flow transmitter and panel-mounted recording receiver-controller with integral control by-pass.

boards undoubtedly have their place and no paper on instrumentation trends today would be complete without an account of the evolution and impact of graphic panels on petroleum process control.

Certainly all approaches to graphic panels today are (or at least they should be) flexible. In these early stages of this comparatively new technique, we should keep our thinking free and avoid crystallizing the subject before it has a chance to bloom into its full style and form of usefulness.

### Pneumatic Transmission

Were it not for the development and advancements made in pneumatic transmission and its wide acceptance by the petroleum industry over the last 15 or 20 years, graphic panels in their present form could not have been a reality. Figs. 14, 15, and 16 illustrate the steps which led to the logical development of the graphic panel.

Fig. 14 is a conventional mechanical recording flow meter, equipped with pneumatic control. The controller is mounted adjacent to (or within 100 feet of) the point of measurement. With this limitation of distance, centralized control of a large processing unit is not possible.

With an increasing demand for fully centralized control rooms, it became necessary to provide remote transmission of instrument readings over a considerable distance. In Fig. 15, the first solution to this problem is illustrated. Here a locally mounted indicating flow meter measures the flow and transmits its reading pneumatically to a recording receiver which incorporates a pneumatic control unit. Mounted integrally with the latter instrument is a control by-pass which permits manual operation of the diaphragm motor valve from the control room.

On certain flow control problems, it was desirable to mount the control mechanism close to the valve to reduce signal lags to a minimum. In order to accomplish this result, the system shown in Fig. 16 was evolved. In this case, the locally mounted indicating flow meter incorporates both the pneumatic control unit and an Indexet mechanism which permits remote adjustment of the controller set point. The panel-mounted recording receiver is provided with a control point setting knob and a set point indicator. Readings from the indicator-controller are transmitted to the recording-receiver, while any changes in control point setting are made at the recorder and transmitted pneumatically to the

FIG. 16. Locally mounted indicating controlling flow transmitter with Indexet, and panel-mounted recording receiver with control point setting knob.

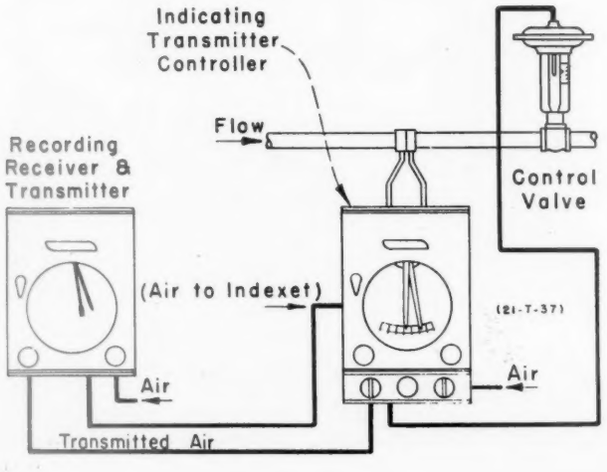
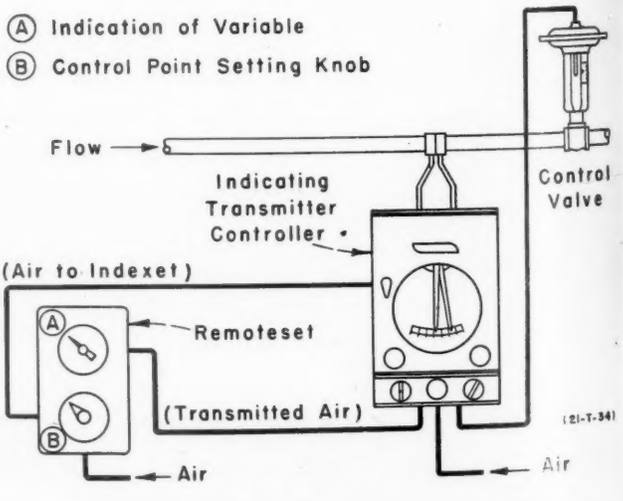


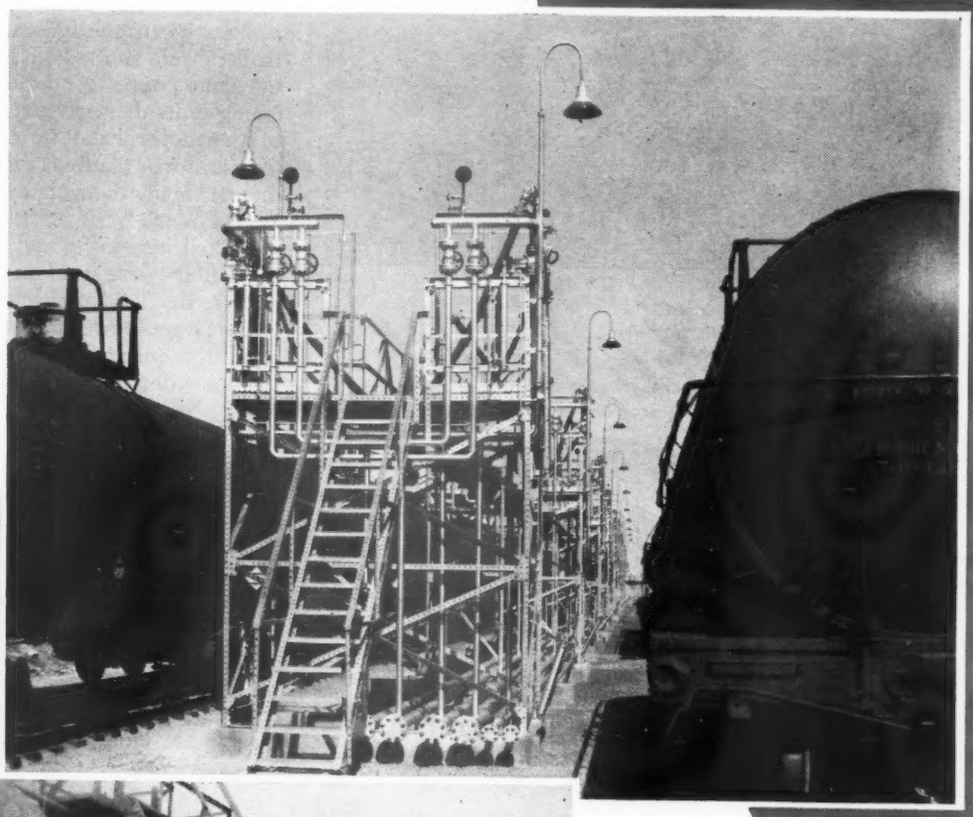

FIG. 17. Locally mounted indicating flow controller with Indexet, and panel-mounted Remoteset unit.



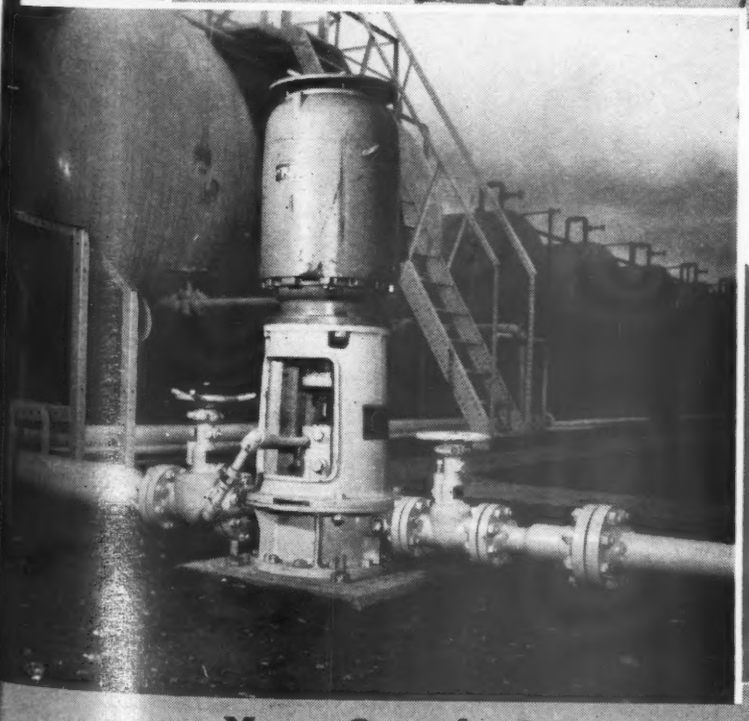
If you are planning a new plant or an expansion program or plan to replace all leaky valves—then specify ORBIT Forged Steel L. P. Gas Valves. No lubricant is required to effect a positive shutoff.

If you have not already received our new price list on ORBIT L. P. Gas Valves write for it today.

# Specify ORBIT FORGED STEEL L.P. GAS VALVES



ORBIT L. P. Gas Valves installed on Centrifugal Products Pump in a Pampa, Texas plant.



This New Mexico Car Loading Rack is entirely equipped with ORBIT Forged Steel L. P. Gas Valves.

ORBIT VALVES ®

## Your Supply Store Carries Orbit Valves

## ORBIT VALVE COMPANY

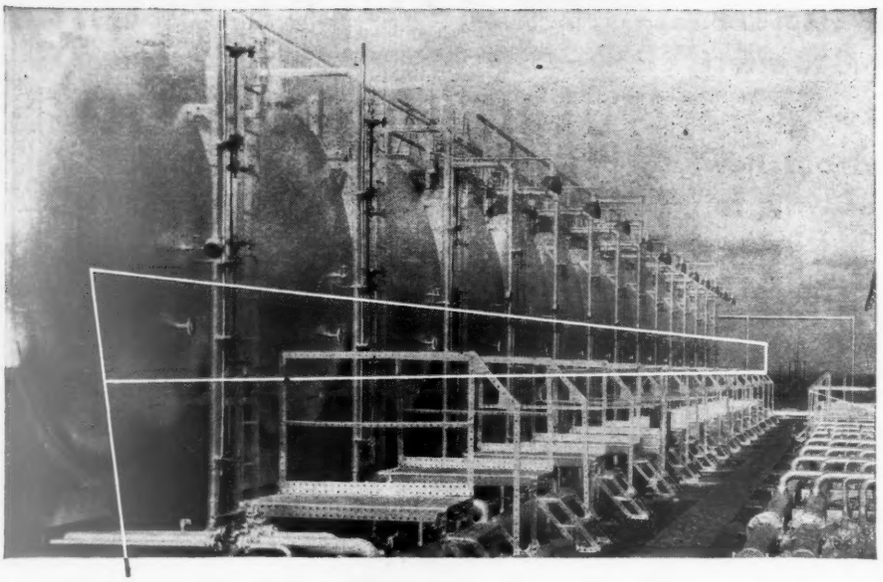
**Box 699 • Tulsa, Oklahoma**

BASIN WAREHOUSE COMPANY Odessa, Texas

ORBIT VALVE COMPANY Houston, Texas

THE GREAT WESTERN COMPANY Casper, Wyoming

® The word Orbit and the Orbit Symbol are registered Trade Marks.

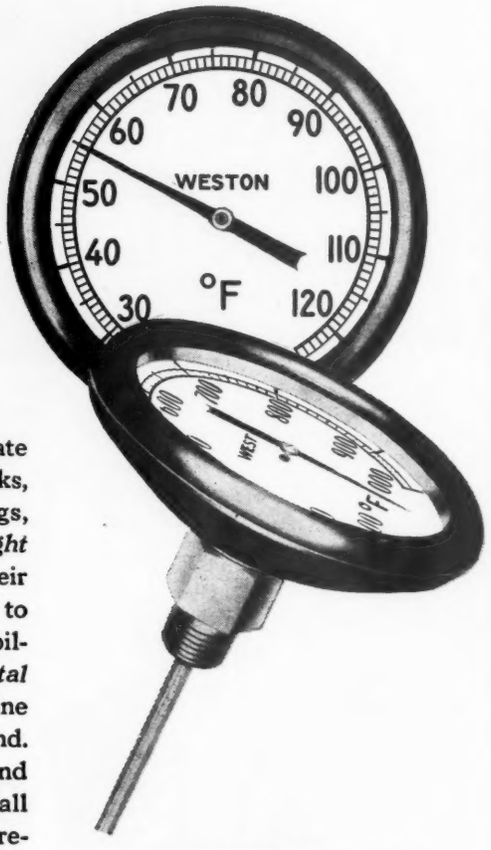


*Right down the line!*

it's

**WESTON**

*All-Metal Thermometers*




Wherever you need quick, accurate temperature readings—on tanks, processing equipment, bearings, pipe lines—specify WESTONS *right down the line.* Not only are their large, boldly marked dials easy to read, but their accurate dependability is assured by WESTON'S *all-metal* construction. They stay on the line longer—cost far less in the end. Available in types, stem lengths and ranges for most applications. Call your jobber or local WESTON representative, or write for Thermometer Bulletin. WESTON Electrical Instrument Corporation, 707 Frelinghuysen Avenue, Newark 5, N. J.

**CONTACT-MAKING models for alarm or control purposes. MAX-MIN models to indicate highest or lowest temperature reached.**

**WESTON** *Instruments*

index setting unit in the indicator-controller. With this system, the integral by-pass, permitting manual operation of the valve, is placed at the locally mounted controller.

### Early Graphic Panels Used Conventional Instruments

Early graphic panels, which made their appearance almost ten years ago, included pictorial flow diagrams of a process where the indicators and controllers were spotted on the diagram at the same points as on the actual processing units themselves. Centralization of thermofor catalytic cracking kiln temperature readings in a graphic manner made their appearance during World War II. Since, in general, conventional indicating and/or recording controllers were used on most of these panels, the flow diagrams were relatively large. However, since size alone is not the only factor to be considered in connection with graphic panels and, since the economics of space, cost, and time savings have not been thoroughly worked out, no conclusions should be drawn that these earlier attempts do not have merit—especially for some types of processes.

The system shown in Fig. 17 was the result of early attempts to achieve compactness. Here, a locally mounted indicating controller, equipped with an index setting mechanism was used in conjunction with a panel-mounted pneumatic unit for remote index setting. This latter device incorporated a gauge which indicated the process variable, and a control point setting knob with calibrated scale. Dial and scale were both calibrated in the same units as the locally mounted controller. The indicator-controller transmitted its readings pneumatically to the gauge of the Remoteset unit. Control point setting was shown on the calibrated scale. A change in this setting was accomplished by turning the knob which changed the air pressure applied to the Indexet device in the controller, and thus shifted the set point index either up or down scale.

This system fulfilled the requirement for a small, compact unit for graphic panel mounting in that it provided both continuous indication of the process variable and a means of positioning the set point index of a remotely mounted controller. It was, however, lacking in two respects:—the integral by-pass affording manual valve operation was situated at the locally mounted controller; and—the controller and all adjustments were located some distance from the control panel. * * *

**Part 3 will be published soon.**

# CHEMICO
## *announces*
# A NEW WAY
## *to make*
# Sulfuric Acid

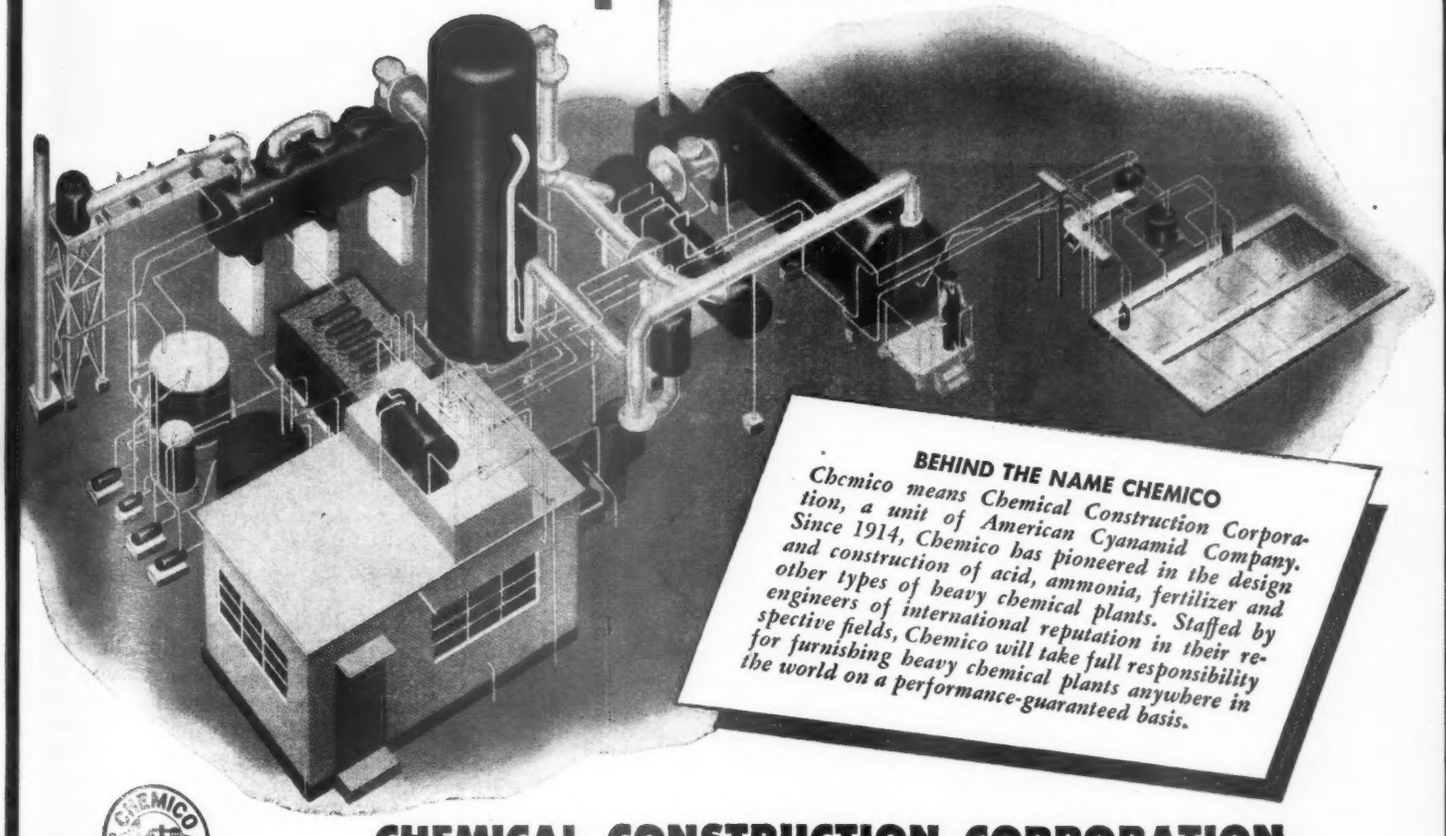
**Whether you make or buy sulfuric acid, this simple new-type Chemico plant will be of special interest to you. Here's why . . .**

Chemico's new process for manufacturing sulfuric acid from sulfur makes it possible for you to *replace* or *enlarge* your present facilities *at considerably less cost* than for the standard type contact plant.

The simplicity of this new Chemico plant is the basic reason for its low cost. *These seven major items of equipment* — usually found in present-type contact acid plants — *have been eliminated*: drying tower, gas filter, heat exchanger, $SO_3$ cooler, acid coolers, acid circulating and transfer pumps, and diluting equipment. In addition, the distinctive features listed below assure more efficient production.

**DISTINCTIVE FEATURES**

- A quench converter eliminates heat exchangers . . . assures higher yield from raw sulfur . . . virtually eliminates atmospheric contamination due to unconverted $SO_2$.
- A multiple-stage dip-pipe absorption system, operating by gravity flow, eliminates the need to distribute acid over packed absorbing towers.
- Water evaporation from absorber acid solutions removes heat of absorption and the sensible heat of the hot gases. Only the product acid requires cooling before storage.
- A built-in Pease-Anthony Venturi Scrubber insures mist elimination in the exhaust stack.
- Plants of this new type deliver sulfuric acid of any strength up to 95% $H_2SO_4$.



**BEHIND THE NAME CHEMICO**

*Chemico means Chemical Construction Corporation, a unit of American Cyanamid Company. Since 1914, Chemico has pioneered in the design and construction of acid, ammonia, fertilizer and other types of heavy chemical plants. Staffed by engineers of international reputation in their respective fields, Chemico will take full responsibility for furnishing heavy chemical plants anywhere in the world on a performance-guaranteed basis.*

*Chemico plants are profitable investments*

## CHEMICAL CONSTRUCTION CORPORATION

**CONSULTING, DESIGNING AND CONTRACTING ENGINEERS**

488 MADISON AVENUE, NEW YORK 22, NEW YORK

EUROPEAN TECHNICAL REPRESENTATIVE

CYANAMID PRODUCTS, LTD., LONDON W.C.2, ENGLAND • CABLES: CHEMICONST, NEW YORK

Heaters in the evaporation section in the sulfation building of Shell's Ester plant at Pernis refinery, Holland.

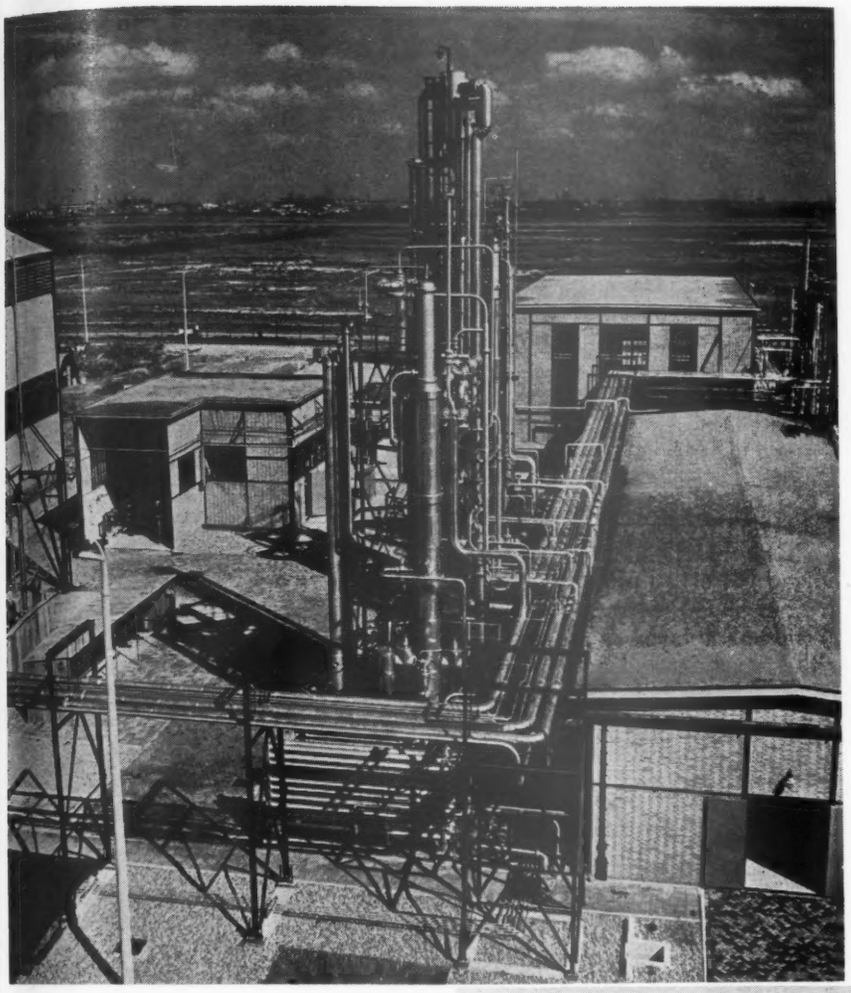
# Refinery Expansion in The Netherlands

V. S. SWAMINATHAN

In September, 1949, Professor J. R. M. van den Brink, the Netherlands Minister of Economic Affairs, officially opened the two chemical plants erected by the Royal Dutch - Shell Group (Bataafsche Petroleum Maatschappiz) adjoining its refineries at Rotterdam-Pernis, as its major post-war contribution to the industrialization of the Netherlands. This company has invested nearly $76,000,000 in the expansion of the refinery since the war and the building of the synthetic soap and plastics factories. Further expansion due for completion by 1952 includes a distillation unit of 6000 tons a day, a high vacuum installation, a large catalytic cracking unit of about 3000 tons daily capacity, a reforming unit and two polymerizers. Tankage capacity, which is now 700,000 tons (Cá 4,700,000 bbl), is being stepped up by new construction to 1,100,000 tons. It is estimated that the labor force for both refinery and chemical plant will be 2600 eventually.

**EXCLUSIVE**

In the detergents section the base material used is paraffin wax. After "cracking" and treatment with acids and alkalis a liquid is finally obtained, which can be used as such as a detergent, or evaporated to form flakes or powder. The soap factory has capacity to produce 25,000,000 kilograms (55.3 million lb) washing soap per annum. The detergent produced scores over ordinary soap in several respects. Its washing effect starts even at low temperatures; it lathers very well in hard water; has great powers of pene-



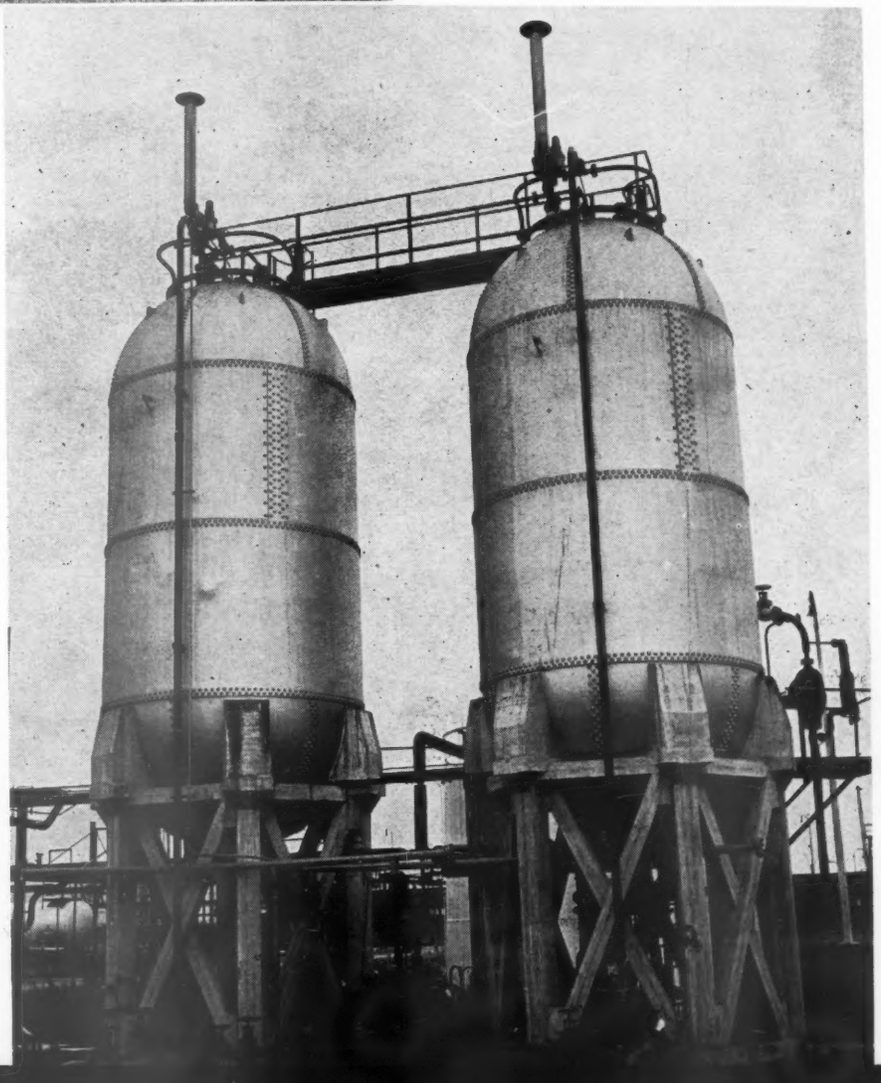
Distillation columns and pump house in Shell's polyvinyl chloride plant for purification of dichloroethane.

tration into the fibres of materials, and no lime soap deposit is left on the materials after washing.

In the manufacture of plastics (polyvinyl chloride synthetic resins) the base materials are cracked gas and chlorine. Pending the completion of the refinery cracked gas is obtained from an outside source. Production capacity of the plastics plant is 2,000,000 Kg. (4.42 million lb) per annum. By applying pressure and heat this thermoplastic can be molded into sheets, plates, tubes, etc. It has great resistance to acids and alkalis. It will be supplied as a base material for industry, the company is not interesting itself in the further processing of the plastic.

According to H. H. Buss, manager of the Bataafsche's refinery at Rotterdam-Pernis, steam consumption of the new plant will be about 300 tons per hour, calling for the purification and evaporation of that amount of feed water every hour. Consumption of cooling water will be 30,000 cubic meters per hour. This quantity will have to be pumped hourly through cooling lines to the various points of consumption, and thence removed by return lines. This entails laying several kilometers of pipe line with a diameter of 100-150 cm (40-60 in) right through the old factory. Product lines have a total length of 1000 Km. (539.6 mi, or 3,280,800 ft). Consumption of electricity will go up to 180,000,000 kwhr a year, with a load of 20,000 kw, which is 2½ times the power consumption for the entire Province of Friesland in 1948.

Before the war Shell's Pernis refinery had a capacity of 1,000,000 tons of crude oil a year and a storage capacity of 700,000 tons. It became a war casualty, so much so that in May, 1945, for all practical purposes, the refinery was unserviceable. By the end of that year 55 per cent of the storage capacity was restored, and in 1947 the refinery's throughput reached 1,200,000 tons. When contemplated extensions are completed, its capacity will be trebled to well over 3,000,000 tons per annum. Then the total area covered by the refinery and



Butane tanks at Pernis refinery. Note wood support structures.

the two chemical plants will equal 1200 acres. Agreement was reached last year with the Gulf Exploration Company in Kuwait, whereby the Shell group in 1948 and subsequent years would take over increased quantities of crude oil to be refined, distributed, and marketed in the Eastern hemisphere.

Early this year nearly 27 per cent of Dutch requirements of finished petroleum products was met by the oil field in the Drenthe Province. At the end of 1947 there were 37 producing wells, and output that year amounted to 213,000 metric tons of heavy and highly paraffinic crude. A new railway line connects the oil field with Pernis.

The Caltex Petroleum Company recently bought a 220-acre site situated along deep water on the Second Petroleum Harbor, on which it is proposed to erect a $20-24 million refinery. To begin with, it will produce petrol, paraffin, gas oil, and fuel oil from Saudi Arabian crude oil. Quick discharge of 27,000-ton tankers is being provided for. The project will take two years to complete, and about a thousand workers will be employed on the job. Initial daily output is envisaged at 20,000 bbl, and by doubling capacity this is later to be expanded to 40,000 bbl a day (nearly 6500 tons a day) or 2,000,000 tons a year. About 500 engineers, technicians, and workers will be employed, and $10,000,000 worth of material bought in the U.S.A.

Lastly, plans are being worked out by N.V.Vlisgingsche Mineraalolieen Asphalt Raffinaderij for further development of its refinery at Rotterdam. With the completion of these extensions Rotterdam should become one of the major oil refining centers in Western Europe.

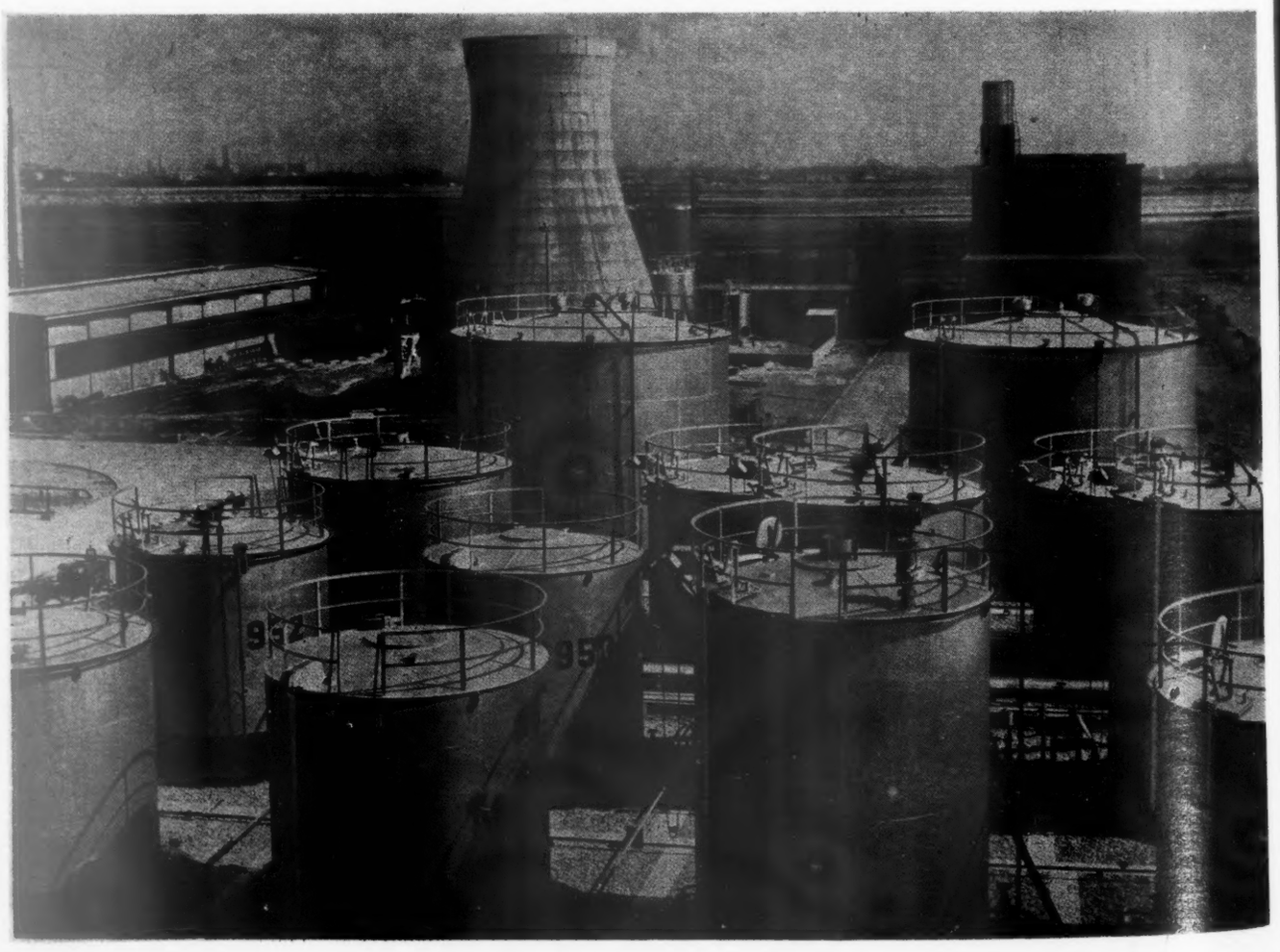
The oil committee of the OEEC in its report on "Co-ordination of Oil Refinery Expansion in the OEEC Countries" last October, states in guarded terms that the decision of the Benelux countries (Belgium, Luxemburg, and The Netherlands) to provide for their own needs of oil products and some surplus for export is justified as Rotterdam and Antwerp, like Trieste and Genoa, are traditional transit points. In 1952-1953 it is estimated that the Benelux countries will have a refinery output of 7,399,000 metric tons, import 643,000 tons, consume inland 4,723,000 tons, and for bunker 1,560,000 tons, leaving 1,799,000 tons for export.

* * *

### Shale-Oil Waxes

Future market demands for paraffin waxes made from petroleum can be partly met by waxes processed from oil shale mined from large reserves in Colorado, Wyoming, and Utah, according to the Bureau of Mines. Fully refined shale-oil wax is virtually identical with the fully refined petroleum variety and could be used in the manufacture of food containers. The cost of making the crude and semirefined grades would be about the same as in making petroleum paraffin wax, and the cost of making a fully refined shale-oil wax would be somewhat greater than for fully refined petroleum paraffin.

Shell's P. V. C. plant at Pernis refinery. Behind the concrete cooling tower are the four vinylchloride monomer storage tanks, and (in the background) the tanks for dichloroethane.



# Aiming for higher octanes?

## See how THIS Mercaptan Removal Process replaces doctor treating AND

- *reduces TEL requirements*
- *gives you low operating costs*
- *requires a minimum of new equipment*

More than seven years of commercial refinery operation have proved conclusively the high efficiency of the Tannin Solutizer Process* for mercaptan removal. This is the process that brings your equipment up to "new plant" standards in the economical treatment and blending of higher octane gasolines, *without* affecting the stability of the treated product.

Converting to the Tannin Solutizer Process requires a minimum investment in new equipment . . . very likely your present equipment will serve with little change.

Operating economy is an outstanding advantage of the Tannin Solutizer Process. Still another important consideration . . . *this process is not corrosive;* does *not* require equipment of special alloys.

*Complete engineering service* is available . . . to help plan your unit, to supervise start-up, to assist in later operation if required. We welcome the opportunity to work with you in achieving the many benefits of the Tannin Solutizer Process.

**The Tannin Solutizer Process is licensed under the patent rights of Socony-Vacuum Oil Company and Shell Development Company.*

**SHELL DEVELOPMENT COMPANY**
**50 West 50th Street, New York 20, New York**

SHELL

# MODERN PIPE WELDING PRACTICES

F. C. FANTZ*

## PART 3

### Nozzle Reinforcement

In considering the reinforcement of a welded nozzle or branch connection, we should realize that our problem is actually the restoration, rather than the addition, of strength. In any nozzle connection, the attachment of a welded branch destroys the circular cross-section of the header and replaces that section with a contour having greatly reduced powers of resistance to internal pressure. This weakness is particularly noticeable in the area marked "X" in detail (A) of Fig. 19.

Unfortunately, laboratory study of the welded nozzle has not progressed sufficiently to provide a basis for a rational mathematical formula to compute replacement needs. The code for pressure piping (like the boiler code and the unfired pressure vessel code) must therefore proceed on empirical assumptions. The code states that the cross-sectional area of the metal removed from the header (taken parallel to its center-line) must be compensated for by an equal area of replacement metal. The stiffening effect of the nozzle itself is allowed for; additional strength needs are generally provided by one of four methods:

1. The use of a saddle type reinforcement;
2. The application of a welded reinforcing ring;
3. The addition of supplementary deposits of metal to the fillet weld; and
4. The use of a welding tee, which is designed to provide full strength.

In addition to these methods, nozzles are sometimes strengthened by increasing the wall thickness of the header or of the nozzle, or of both.

The welding saddle shown in detail (B) of Fig. 19 not only reinforces the header section to compensate for the metal cut away, but also supports the flat section of the branch shown at point "X." In addition, the neck of the saddle extends for some distance above the header pipe before being welded to the branch. Therefore, the stresses set up by flexing of the branch line are distributed away from the crucial weld joining the branch and the header.

The ring type reinforcement, detail (C), will adequately strengthen the header itself, but does not take care of the critical portion of the nozzle at point "X," nor contribute to minimizing the effect of the flexing stresses.

Note that regardless of the replacement method used, we are primarily concerned with compensating for the strength lost by cutting into the header pipe. Any reinforcement applied beyond this replacement need is superfluous.

In this connection, we might state a general principle in piping design. The engineer determining the method of header reinforcement has the choice of two alternatives: First, to make the reinforcement so heavy that no movement can take place in the vicinity of the junction; and, second, to design the reinforcement so that the entire section is flexible to a certain degree. In the first case, he is faced with the necessity of graduating the heavy structure to the normal condition of the pipe line in order to prevent concentration of stresses. In the second case, the structure is prepared so that it will adjust itself to the operating conditions. I would very much prefer the latter method; as a matter of fact, in my opinion, the entire piping system should be designed to allow its adjustment to operating conditions. I have seen many a bend and header, removed from the line after a period of successful operation, changed materially from the original dimensions due to improper flexibility calculations.

It is important to note that neither the saddle nor the ring type reinforcement should be considered as a pressure member; in fact, a hole should be drilled through the ring or saddle to relieve the pressure of gases during the welding operation. In addition, this vent will serve to accommodate expansion of the air or gas between the reinforcement and the piping during operation of the line at high temperature.

We have learned the necessity of these vents through sorry experience. Many years ago, we fabricated headers equipped with ventless saddles and ring reinforcements, following which the assemblies were placed in the heat-treating furnace and brought to 1600 F. When they were removed and cooled, it was found that the pipe had bulged inward due to the expansion of gases in the air space between the reinforcement and the pipe. This same condition would certainly appear to a lesser degree in refinery operation.

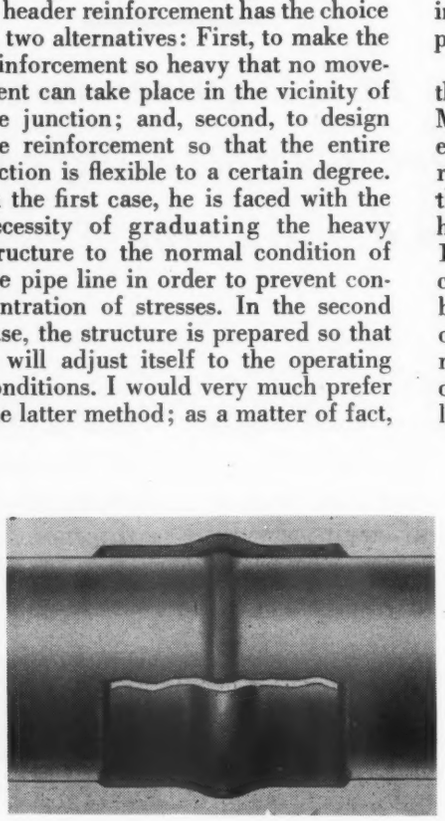
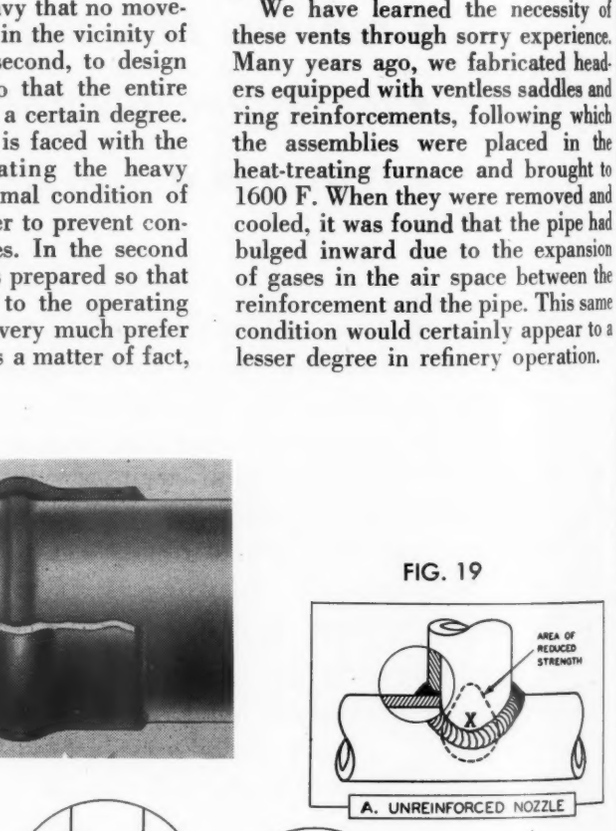


FIG. 20

FIG. 19




*Vice President, Midwest Piping and Supply Company, Inc.

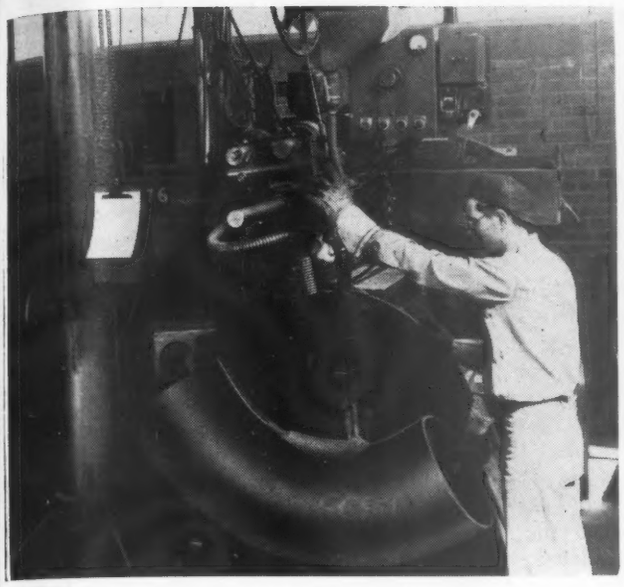


FIG. 21

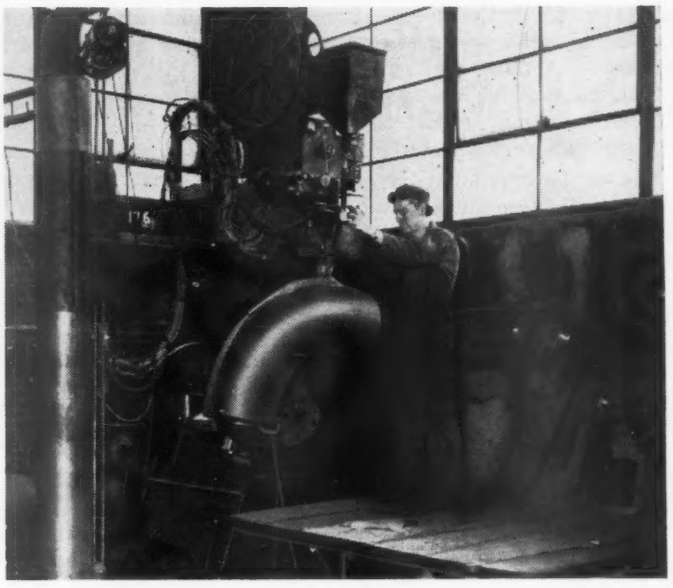


FIG. 22

It is generally considered that where the branch connection is one-quarter the size of the header (i.e., a 3-in. branch on a 12 in. header), or less, very little reinforcement is necessary. In such cases, the necessary strength can be provided by increasing the amount of deposited weld metal, as shown in detail (D) of Fig. 19.

### Butt-Weld Reinforcement

We are frequently asked, "Should a butt-weld in a pipe line be reinforced?" We have stated before our conviction that two pieces of pipe joined properly by welding will have physical properties equal or superior to the parts joined. There are, however, conditions where it seems advisable to reinforce the butt-weld for other reasons. For example: In pipe lines laid in river beds, or in places where we are likely to encounter sudden and violent distortion in the position of the pipe from such natural causes as landslides or wash-outs, it may be preferable to apply additional reinforcement to the butt-weld. In such cases, welding sleeves as shown in Fig. 20 have been used to distribute the excess stress away from the welded joint. In the application of the sleeve it is customary to make a full strength weld between the two halves of the sleeves and, in addition, circumferentially around each end of the sleeve. Unquestionably, the strength weld between the two halves is necessary; however, if the sleeves are properly fitted, these longitudinal welds will make a shrink-fit on the pipe, and should eliminate the necessity of any weld between the ends of the sleeves and the pipe.

Note that a welding sleeve, like a welding saddle, should not be considered a pressure member. Rather than use the sleeve to seal a defective weld, precaution should be taken to insure that the butt-weld will be properly made, so that no pressure seal is necessary. Similarly, the sleeve should not be applied as a strength member to hold the two sections of pipe together. This is properly the function of the butt-weld alone.

### Welding Procedures

Let us refer again to the statement that with proper procedures and supervision, welded joints are equal in strength to the parent metal. In order to accomplish this, tried and proven welding processes are a "must." The various Codes have set up certain minimum requirements for various types of pipe welding. It will not be amiss to quote here from the ASA Code for Pressure Piping (B31.1) which states: "Each manufacturer or contractor shall be responsible for the quality of the welding done by his organization, and shall conduct tests not only of the welding procedure . . . but also of the welding operators. . . . It is assumed that the manufacturer or contractor performing the welding has an organization familiar with this code and capable of designing, engineering and supervising welded piping constructions." Note the emphasis on the necessity that all members of the organization be familiar with welding, and capable in performance.

### Developments in Welding Processes

To the designer or engineer falls the delicate task of picking a particular type of welding that will meet his specific requirements. In this, he has a choice of several methods. Time limitations prevent a complete discussion of this matter here; we can, however, consider the newer types of welding and their application to piping systems.

One of the more modern methods which shows great promise in the development of the welding art is the submerged-arc type. This process is adaptable both to semi-automatic and fully-automatic welding. The submerged-arc method is not new; very good welds have for some time been made in plate and other types of construction work, but it is only recently that the process has been adapted to pipe fabrication.

Submerged-arc welding produces an arc between the parent metal and a bare electrode of analogous composition. The arc is submerged in what is called a "melt," which is generally a granular limestone-and-silica-sand product, with the addition of certain other materials in small amounts. The melt is applied to the area of the weld in sufficient quantity so that the arc is entirely submerged in the pile, thus making it unnecessary for the operator to wear goggles. The high heat of the arc melts the welding rod and produces a fusion temperature in the parent metal. Simultaneously, a portion of the melt is fused, producing a heavy glass-like coating which adheres to the deposited metal and shields it from gases in the air during its first stage of cooling. As the weld progresses, the coat of fused melt cools faster than the weld metal and separates freely. The weld deposit is controlled by varying the amperage and voltage of the current, and the rate

of travel. (Note that the work may be moved beneath the electrode, or the electrode over the work; but in either event, all welding must be done in a "down" position, so that the electrode is always above the part to be welded.)

As we have pointed out, the practical application of new oil refining processes is sometimes more difficult to achieve than their theoretical development. This was also true when we attempted to apply the submerged-arc process to intricate and complicated piping assemblies. The additional equipment necessary to position the welding apparatus, and to revolve or move the work beneath the welding arc, involved laborious research, costing many times as much as the basic welding equipment.

In Fig. 21 we show the application of the submerged-arc method to a 90 deg welding ell having tangents or straight sections on each end. Note that the machinery supporting the welding head may be likened to a radial drill-press, as the radial arm can be raised to any desired position and can be swiveled through 360 deg. The welding head can be moved on the radial arm either manually, or by electric controls which are set for a specific rate of travel. Various types of work-revolving machines can be positioned under this head, so that when the welding apparatus is stationary, the work can be revolved beneath the welding arc.

More than one work-revolving machine may be positioned within range of the radial arm, to accommodate different sizes or classes of work.

The melt is carried in a hopper at the top of the welding apparatus and fed to the work through a flexible hose and suitable nozzle. The wire is fed from a spool through a smaller connection to the work.

Fig. 22 shows the application of submerged-arc welding to the outside weld of a 14-in. OD elbow with long tangents. Note that the fused portion of melt is separating from the weld approximately 16 in. behind the arc, leaving a very smooth and evenly-contoured weld deposit.

The welding of long tangent ells presented quite a problem: It was necessary for the welding head to travel horizontally along the radial arm in order to weld the tangent portion (for the elbow in Fig. 22, approximately 5 in. in length); then the head must stop and the machine supporting the ell rotate the fitting beneath the welding apparatus until the curved section has been completed; at this point, the motion of the ell must cease, and the head continue its movement until the other tangent section has been completed.

The entire procedure, including selection of materials, preparation of the groove, spacing, voltage and amperage, speed of travel, rotation of work and size of welding rod is all predetermined, and the resultant weld carefully checked by destructive and radiographic tests to determine its suitability for the work intended. The starting and stopping of the procedure is controlled by push-button, and once the machine is properly set, this push-button is the only control retained by the operator. He can in no way affect the quality of the weld.

The application of the process to inside beading is illustrated in Fig. 23. The welding head has been reversed to feed the wire upward through a curved conduit, which also supports a hopper for the melt. The shape of the conduit is such that the elbow can revolve freely over it.

Fig. 24 illustrates the submerged-arc procedure used for welding of tees. In this case, the welding head travels over a fixture which holds a number of fittings. After the process is completed, the welds are cut between each tee. Note the sliding shoe which is required to dam up the melt to the proper depth. While one "dolly" of fittings is being welded, another is being loaded and rolled into position on the track shown behind the operator.

After we had made some progress with the individual automatic welding machines designed for a particular job, it was decided that there were possibilities in applying this process to the general run of pipe fabrication. This was not as easy as it first appeared to be: The welds in fabricated piping are of many types and do not appear in large quantities. The problem of setting up both work and welding machine became a major item. The design was approached from the standpoint of devising a mechanical means of doing the same thing that a welder does—namely, pick up an electrode holder, carry it to a given position, guide it in the proper manner over the work to be welded, and then move on to another assembly. With this approach to the problem, we designed the machine shown in Fig. 25. It is essentially an overhead gantry-type of bridge, carrying the welding head and the electrical and mechanical means for moving this head up, down and across the bridge in any direction. The crane itself is moved electrically up and down the shop on parallel tracks, flush with the floor. The traveling crane carries its

FIG. 23

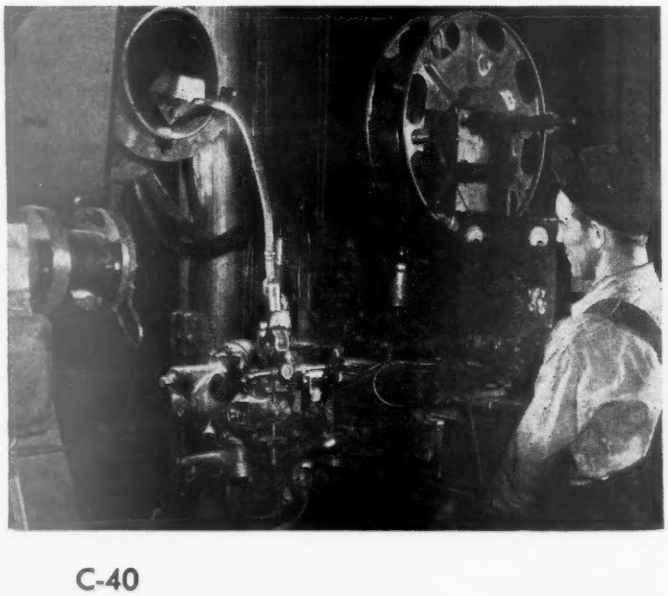
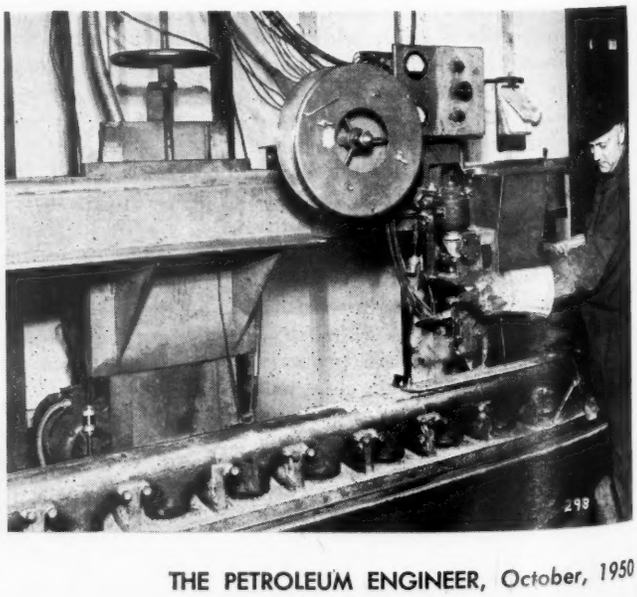


FIG. 24



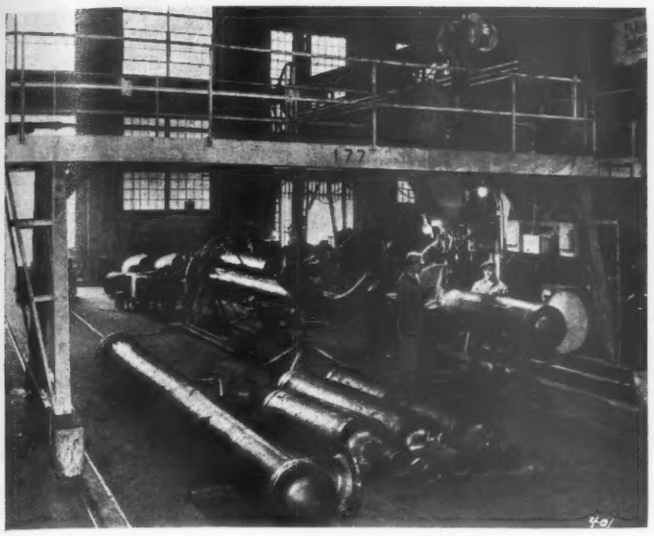


FIG. 25

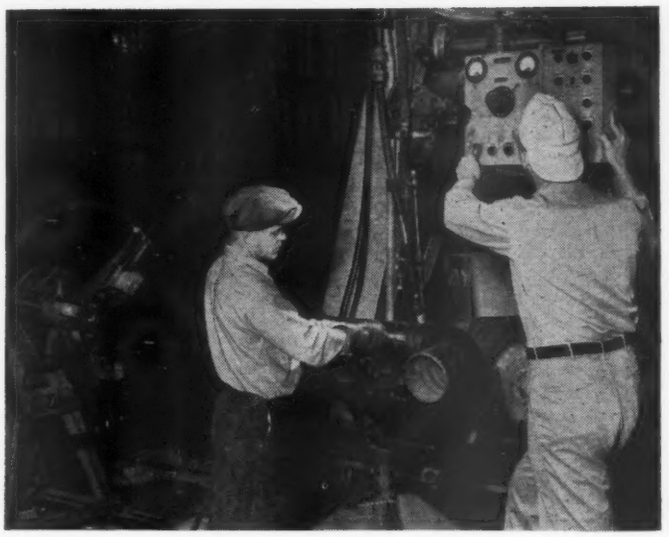


FIG. 26

own generator, and all electrical current is fed through three bus-bars with sliding contacts parallel to the floor track. All of the controls for movement of the crane and movement of the welding head, as well as the regulators for amperage, voltage, speed of rod, etc., are contained in a panel that moves with the welding head, so that it is accessible at all times to the welding operator.

Positioned in the area covered by the gantry crane are various types of work-rotating and moving equipment, each designed to handle a range of sizes and types of work. During the welding, the machine to be used is plugged into the panel adjacent to the welding head, so that all controls are centralized. In stating that the work-rotating machines are grounded, we might emphasize that the ground connection in any welding apparatus (both manual and automatic, but particularly the latter) is as important as the lead to the welding electrode. Any variation in the carrying capacity of the ground connection will affect the results of the welding operation. On the apparatus shown in the photograph, large wiper shoes, spring loaded, are in contact with the track to produce a ground which will insure uniform carrying capacity.

In the operation of this submerged-arc welding machine, one crew operates the gantry and the work-rotating machine over which it is positioned; another crew is occupied in placing work in the other turning machine within range of the gantry, using for this purpose an overhead crane which travels above the welding apparatus. It takes less time to move the gantry and its equipment from one rotating machine to another than it does to describe it to you, and the contrast between manual and machine-operation is made quite clear by this photograph.

Fig. 26 provides a close-up of the welding head, showing the controls of the gantry and the welding apparatus. The instrument box on the left controls the head and the work-revolving machine; the one at the right controls the movement of the gantry and the vertical movement of the head.

A new machine (Fig. 27) has been developed for rotating pipe assemblies which are difficult to hold in a chuck or clamp. One "steady rest" is stationary; the other can be positioned to accommodate assemblies of varying length. The pipe rests on idler rollers and is turned by means of chains which grip the assembly. Means are provided to break these chains at various points to permit removal of the pipe and insertion of a new assembly. Air cylinders are used to take up slack in the chains and produce suitable tension on assemblies of varying diameters. The machine was designed with controls which permit a change in the rate of rotation during welding. A number of other novel features have been included to enable the use of the machine for experimental work in automatic welding.

The submerged-arc welding process is capable of welding relatively heavy thicknesses of plate at one pass, but our attempts to transfer this to circumferential welds in pipe prevented suitable application of the process for some time. Owing to the curvature of a circumferential butt-weld, it is impractical to carry a large puddle of molten metal at one time—a restriction not encountered in the welding of flat plate, or tubular sections of large diameter. It was only when we decided to use several passes or beads on a given thickness of metal that we were able to make circumferential butt-welds that would meet all of our requirements. These overlapping beads are continuous; once the welding is started, we do not stop the work, or break the arc, until the entire weld is completed. This is made possible by the fact that the removal of slag in the submerged-arc process does not present a problem. Such inclusions are practically non-existent; hence, no difficulty is encountered in continuing the rotation of the piece to lay one bead over another.

The necessity of building up a weld in several passes proved to be a blessing in disguise. By laying a continuous bead, we avoided the difficulties often occasioned by breaking the arc and starting a new weld over a partially cooled deposit. In addition, we found that each succeeding pass applied over the previous one tended to stress-relieve the completed portion of the weld, so that in the finished weld, we have coarse grain structure and locked-up stresses only in the last bead or overlay.

This disadvantage of the multiple-pass method lies in its cost, which is, of course, more than that of laying a single bead. But pressure and process piping demand the very best welding obtainable, and cost becomes a secondary item.

### Preparation of Welding Grooves

The preparation of the groove for automatic welding is more important than it is in the case of hand welding. In the latter, the operator can compensate to a certain extent for discrepancies in preparation; in automatic welding, the operator has no

FIG. 27

FIG. 28

control over the process once the welding is started. The type of groove and the spacing of the parent metal, whether the welding process is manual or automatic, will depend largely upon the procedure being used. Generally speaking, the parts should be separated by a distance equal to the shrinkage of the joint at right angles to the direction of the weld. If the spacing is wider than necessary, the operator must build up a bead on each side—in effect, reducing the amount of spacing—and then continue the weld. If the spacing is too close, the operator will have difficulty in securing complete fusion and penetration to the inside of the pipe.

Regardless of the shape of the groove or the slope of its sides, the details of preparation will depend upon the skill of the operator and the size of the electrode being used. For economy and ease of welding, the width of the groove should be no greater than is required to produce complete fusion to the bottom of the weld and to permit easy removal of slag from each bead. The shape and preparation of the welding groove is a very definite part of the welding procedure, and tests made to qualify that procedure will prove whether the details are competently planned. The qualification tests of the operator will prove or disprove his ability to produce a sound weld by following the established procedure. It may be that the procedure will require a change, in order that the average welder can achieve good results.

The method by which the groove is formed is most important. Cutting should be done either by a machine-guided oxy-acetylene torch or by a machine tool, such as a lathe or pipe-cutting machine. A hand-manipulated cutting-torch should not be used to prepare a welding surface, for, inevitably, the oxygen stream will produce irregular grooves containing slag deposits. Such deposits are very hard to work to the top of the puddle by any welding procedure. Where it becomes necessary to use a hand torch, the cutting should be followed by grinding or otherwise smoothing the welding surface.

In contrast, the bevel produced by a properly adjusted, machine-guided torch is very smooth, and the small amount of slag or oxide adhering to the work surface is readily removed before welding. But, in any event, no high or low spot should be allowed to remain on beveled surface to trap slag.

A machine has been designed to move a cutting torch to generate the shape of a branch intersection (Fig. 28). This machine will produce intersections at angles from 45 to 90 deg to the header, and bevels the pipe while cutting the proper shape. The apparatus can also produce beveled or straight cuts for longitudinal butt-welds.

### Aluminum Welding

In discussing new welding procedures, attention might be given to the development of welding processes for aluminum piping. This metal, with its many chemical and structural advantages, will play an increasingly large part in refinery piping. We are currently fabricating aluminum piping, including complex welded assemblies and welding fittings, for installation in a plant in Texas where operating conditions are minus 300 F. The material is 3S aluminum, and must withstand a Charpy impact test of 15 lb minimum at the stated temperature.

Thin-walled aluminum sections of thickness of $\frac{3}{16}$ or $\frac{1}{4}$ in. may be welded without beveling, provided the material is spaced properly. Preferably, the weld should be backed up with a strip of aluminum (copper or stainless steel strips may also be used, but require removal upon completion of the weld).

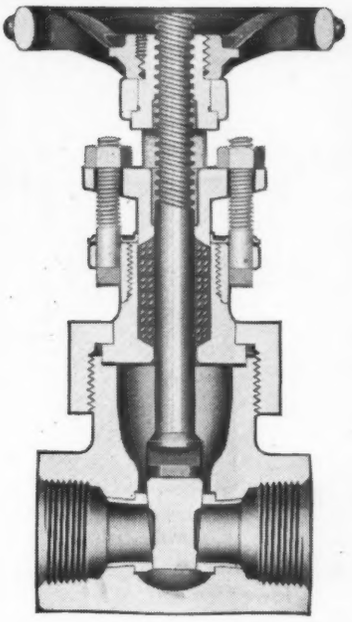
At the present time, we are welding aluminum with an AC Tungsten arc, shielded with Argon gas. The amounts of Tungsten and Argon vary with the wall thickness. The aluminum filler-metal is $\frac{3}{16}$ to $\frac{1}{4}$ in. rod. This type of welding may be used in all positions, and preliminary tests indicate that the procedure can be adapted to welding without backing rings.

Welders for this type of work should be selected with care. We find that combination or acetylene welders are generally superior, due to their training in the use of both hands. This ambidextrous ability is quite important, since any contact between the Tungsten electrode and the aluminum filler-rod will cause large amounts of Tungsten to disintegrate and become imbedded in the molten pool. Such a condition will cause poor welds, and will be revealed by x-ray examination. This same characteristic requires the use of extreme care in starting the arc, which should be done on a small piece of aluminum or copper lying close to the starting point of welding.

In welding aluminum pipe in sizes 12 in. and larger, automatic welding equipment may be used for both circumferential and longitudinal welds. This type of equipment also operates on the Tungsten arc shielded with Argon gas. The amount of Argon consumption will be approximately the same as in hand welding.

Based on current experience, the welding time for aluminum is about the same as for carbon-moly piping, or approximately two to three times that of carbon steel. This holds true for both automatic and hand welding. Where no cutting or shaping is involved, the setting-up time is approximately 50 per cent greater than that for steel. ***

# Big help to any standardization plan ...the complete CRANE line



No. 3602X, 600-Pound Small Steel Gate for oil or oil vapor up to 1100° F. Exelloy to Exelloy seating. Sizes: ¼ to 2-inch. Screwed or welding ends.

## MODERATELY PRICED SMALL STEEL VALVES

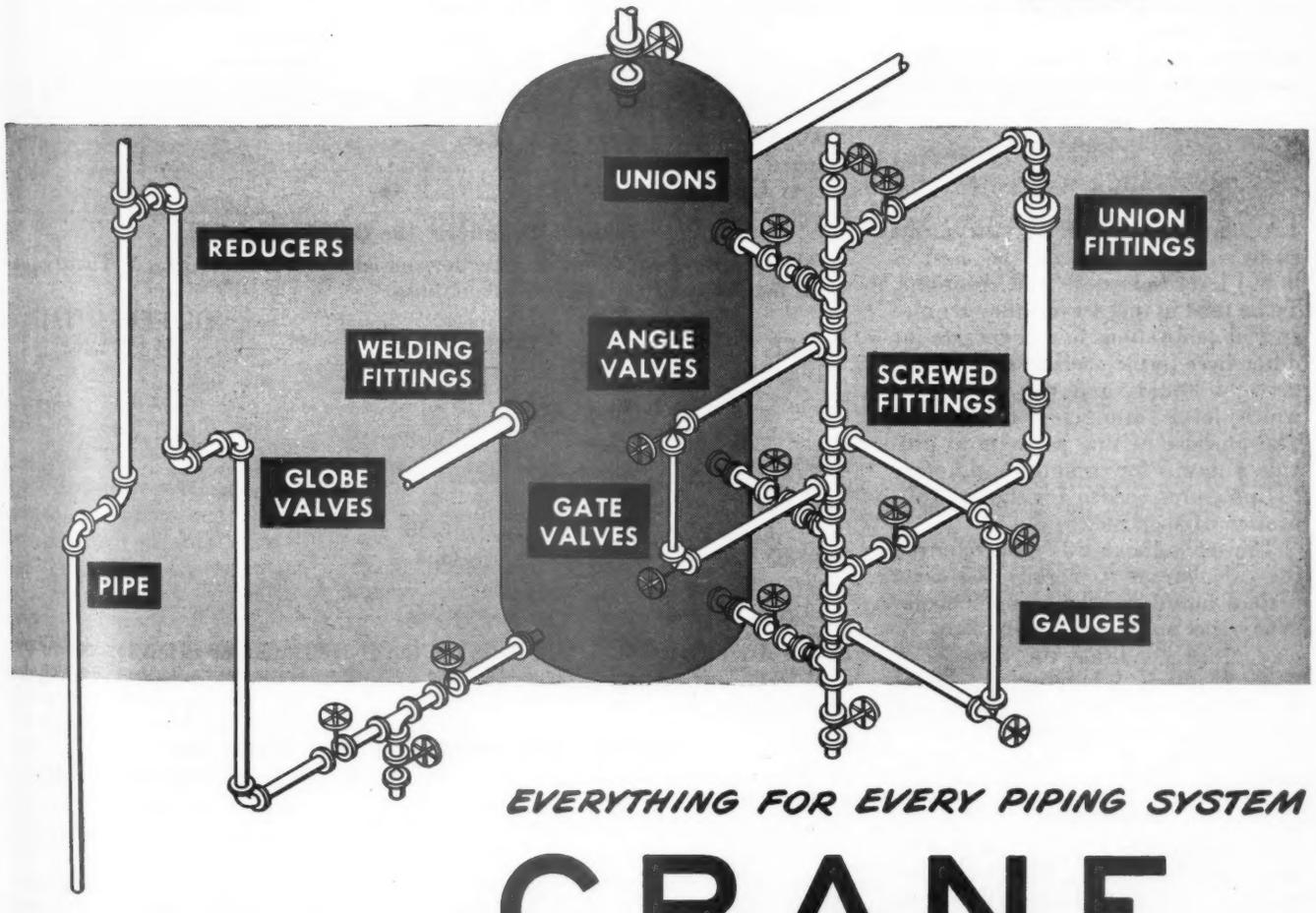
Why moderately priced? Because of Crane Co.'s better facilities for *quality* mass production. Designed to withstand tough services, Crane Small Steel Gates provide extra strength and safety under piping and pressure strains, and extreme temperature variations.

These rugged, compact valves are easy to service . . . easy to operate. Husky union bonnet ring with long thread engagement pulls up easily, stays tight, protects against distortion when valve is opened. T-head disc-stem connection gives flexibility for smooth operation. Fully guided solid wedge disc cannot get out of line, drag on seating surfaces, or jam in body.

Little routine maintenance required. Deep stuffing box with one-piece gland and gland flange assures tight stem seal. Outside screw and yoke construction keeps stem threads out of contact with line fluids, simplifies lubrication. See your No. 49 Crane Catalog, or write for Circular AD-1741.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
*Branches and Wholesalers Serving All Industrial Areas*

**ONE ORDER TO CRANE COVERS ALL PIPING NEEDED FOR THIS GAUGE GLASS HOOK-UP, FOR EXAMPLE**



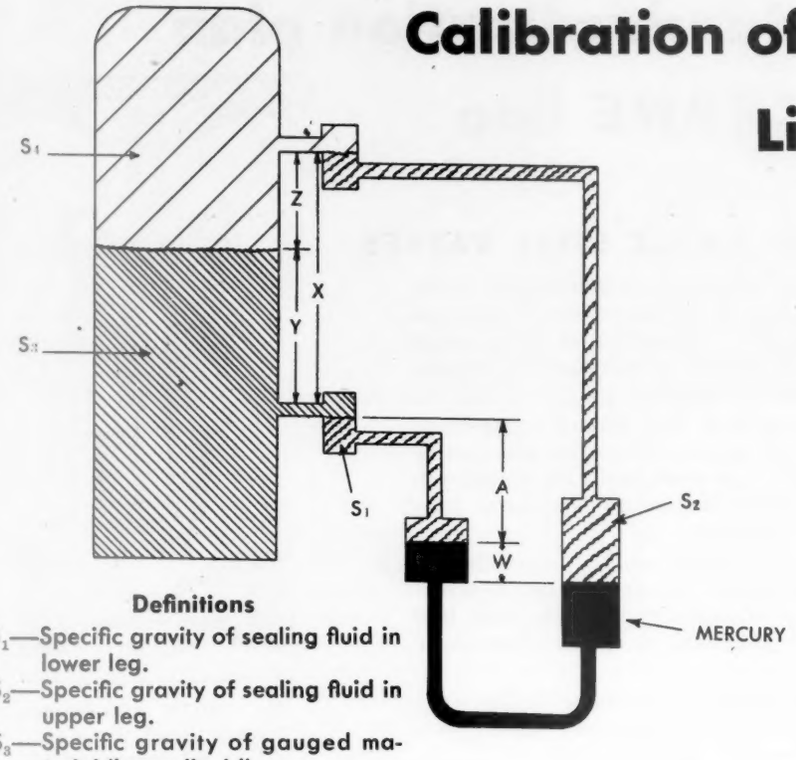

*EVERYTHING FOR EVERY PIPING SYSTEM*

# CRANE

*VALVES • FITTINGS • PIPE • PLUMBING AND HEATING*

# Calibration of Differential Type Liquid Level Meters

ROBERT TOBI*




**Definitions**

$S_1$—Specific gravity of sealing fluid in lower leg.
$S_2$—Specific gravity of sealing fluid in upper leg.
$S_3$—Specific gravity of gauged material (heavy liquid)
$S_4$—Specific gravity of upper liquid (light liquid)
x—Distance between taps, inches
A—Distance of lower pot above meter, inches
Mercury—Specific gravity = 13.58
w—Mercury differential, inches

FIG. 1

DIFFERENTIAL measuring instruments such as flow meters may be used as liquid level indicators and recorders. To be used in this service they require special calibrations to compensate for differences in the specific gravities of the seal liquids and the liquids for which levels are being determined. The purpose of this paper is to provide a means for computing differential pressures needed for the dry calibration of such meters.

The table above lists data required for calculations. Generally the same sealing liquid is used in both manometer legs so $s_1$ will be equal to $s_2$. Under this condition the distance A is not required. Where interface level installations are not being considered $s_4$ is assumed to be zero.

Refer to Fig. 1.

### Supression

By referring to Fig. 1 it can be seen that with the sealing liquid and the liquid in the tank having the same specific gravities there will be zero differential measured by the meter with 100 per cent level, but if the material in the tank is lighter than the seal there will be a differential.

The differential in inches at 100 per cent level is called the suppression range in inches.

Suppression is also expressed as a percentage of meter range. For example, if the range was 100 in. from 0 to 100 per cent level and the differential was 45 in. at 100 per cent level the meter would be said to have 45 per cent suppression. As another example, a 50 in. meter with 100 per cent suppression would operate from 50 in. to 100 in. differential; its "high side" mercury pot would have the same area as a 50 in. meter but with the length of a 100 in. meter. * * *

*Burke and Reynolds Construction Company.

### Data Required for Calculations

Distance between meter taps .....inches (X)
Distance of lower seal pot above water .....inches (A)

| | Specific Gravity at 60 F | Operating Temperature (T) °F | Specific Gravity at T °F | |
|---|---|---|---|---|
| Sealing Material (lower leg) | ..... | ..... | ..... | ($s_1$) |
| Sealing Material (upper leg) | ..... | ..... | ..... | ($s_2$) |
| Gauged Material | ..... | ..... | ..... | ($s_3$) |
| Upper Liquid | ..... | ..... | ..... | ($s_4$) |

### General Equations for Dry Calibration

The following equations may be derived with reference to Fig. 1. These equations may be used for all level calculations.

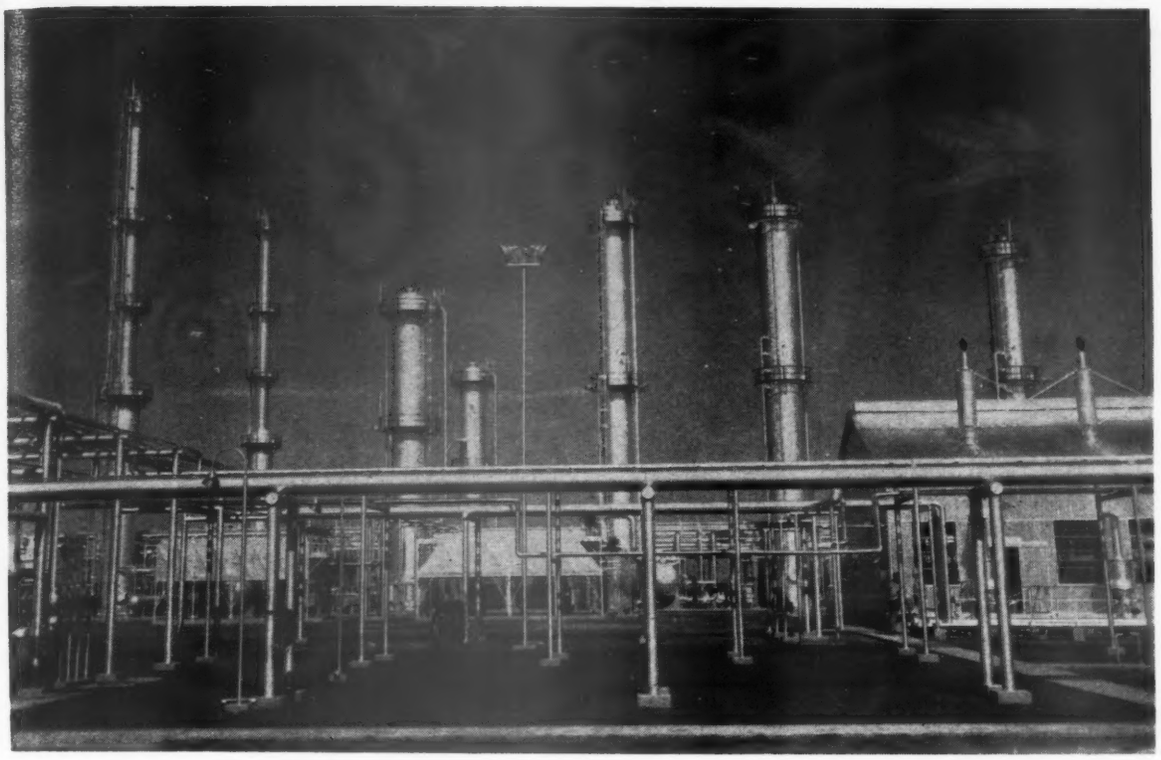
| LEVEL | EQUATION | DIFFERENTIAL "$H_2O$" DRY |
|---|---|---|
| 0% | $\dfrac{A(s_2 - s_1) + x(s_2 + s_4)}{1 - \dfrac{s_2}{13.58}}$ | ..... |
| 50% | $\dfrac{A(s_2 - s_1) + x(s_2 - 0.5s_3 + 0.5s_4)}{1 - \dfrac{s_2}{13.58}}$ | ..... |
| 100% | $\dfrac{A(s_2 - s_1) + x(s_2 - s_3)}{1 - \dfrac{s_2}{13.58}}$ | ..... |

The denominator $(1 - s_2/13.58)$ in the above equations is the correction for seal liquid on mercury. If an aneroid or non-mercury type meter is used the denominator is 1.

### Normal Level Installation With Water Seal

| LEVEL | EQUATION | DIFFERENTIAL "$H_2O$" DRY |
|---|---|---|
| 0% | $\dfrac{x}{0.9264}$ | ..... |
| 50% | $\dfrac{x(1 - 0.5s_3)}{0.9264}$ | ..... |
| 100% | $\dfrac{x(1 - s_3)}{0.9264}$ | ..... |

For aneroid or non-mercury type meters the denominator is equal to 1.



Plant yard piping showing compressor building at right.

# Ultra-Modern Ideas Used in Carthage Plant

## *Pure $C_3$ and $C_4$ Streams and Careful Product Fractionation Characterize the Operation of This Outstanding Gasoline Plant*

ARCH L. FOSTER*

THE design, layout, and general operation and operating results for the new, enlarged gasoline plant of United Gas Pipe Line Company at Carthage, Texas, is one of the most outstanding examples of the "highly complex simplicity" that has been developed in recent years in building plants and handling huge volumes of wet field gas to recover the greatest percentage of commercially valuable products therefrom. This huge plant has been built in two parts and has a total raw gas capacity of 220,000,000 cu ft per day. Of this capacity the older plant, built by Stone and Webster in 1945, has 100,000,000 cu ft and the new plant, completed in 1949 by Hudson Engineering Company, handles 120,000,000 cu ft.

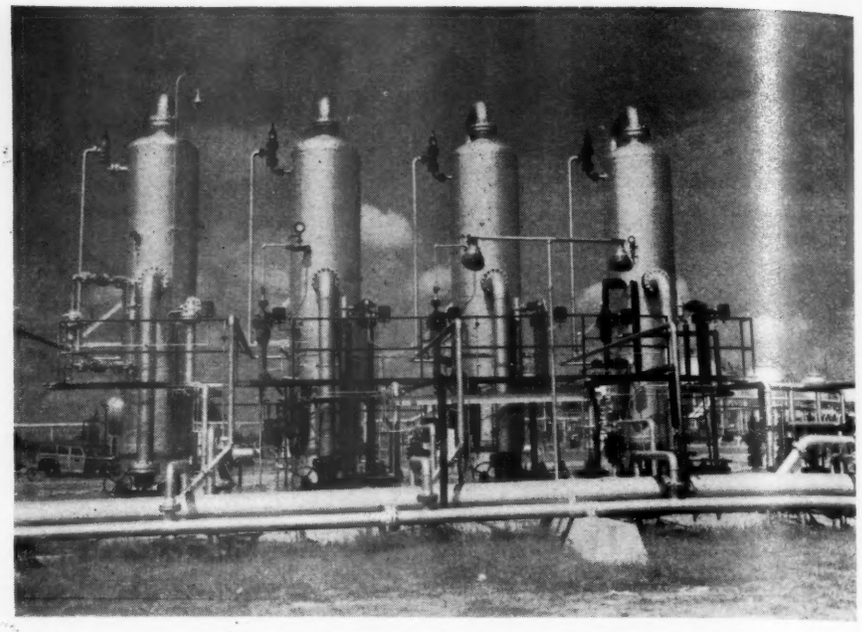
In general, the raw gas is admitted to the plant through scrubbers, thence to a battery of absorbers, is thus stripped of recoverable hydrocarbons, is dehydrated, and then is delivered to United's 24-in. line to Sterlington, Louisiana, and the 18-in. line to Longview, Texas. These main lines feed gas both east and west from said plant for consumption as domestic and industrial fuel. In dehydrating gas, four towers, containing 21 tons each of Florite, are installed; also 8 towers containing 3 tons each of Sova-Bead desiccant, which reduce the water content of the stripped gas to negligible values, maintaining a dew point of approximately —15 F.

Raw gas from the field "loop" enters the scrubbers to both units of the plant, at 1050 psig, where considerable amounts of condensate are trapped. The routine of its rectification will be discussed later herein. Gas into the high pressure absorbers enters at about 80-85 F and leaves the top of the absorbers at about 100-110 F. Two absorbers are employed in the old unit, while three in the (No. 2) unit accomplish the same results as do the two older towers. Lean oil enters the top of these absorbers at 95-100 F and rich oil exits from the tower bottom at 90-95 F.

*Refining and Gas Processing Editor.

EXCLUSIVE

This rich oil from the high pressure absorber is transferred under its own pressure to the 500 psig rich oil flash drum where a good part of the lighter material picked up in the absorber is vaporized and flashed off. Vapors from the Number Two 500-lb flash drum pass to the 500 psig reabsorber, chiefly for the purpose of recovering more LPG product. Partly flashed rich oil then passes to the Number Two 250 psig flash drum where more light material is released. Vapors from this drum go to engine suction and are then discharged to the low pressure pipe line system. The partly denuded oil from the 250-lb drum enters the low pressure drum and is flashed at 100 psig. The No. 1 plant has one 500-lb and one 200-lb flash drum; No. 2 has one 500-lb, one 250-lb, and one 100 - lb "Propanizer - Reabsorber." Vapor from the low pressure reabsorbers go to boiler fuel, mainly. The top portion of the No. 1 low pressure flash vessel is a reabsorber running at about 60-lb pressure.



High pressure inlet scrubbers on east side separate condensate from gas stream.

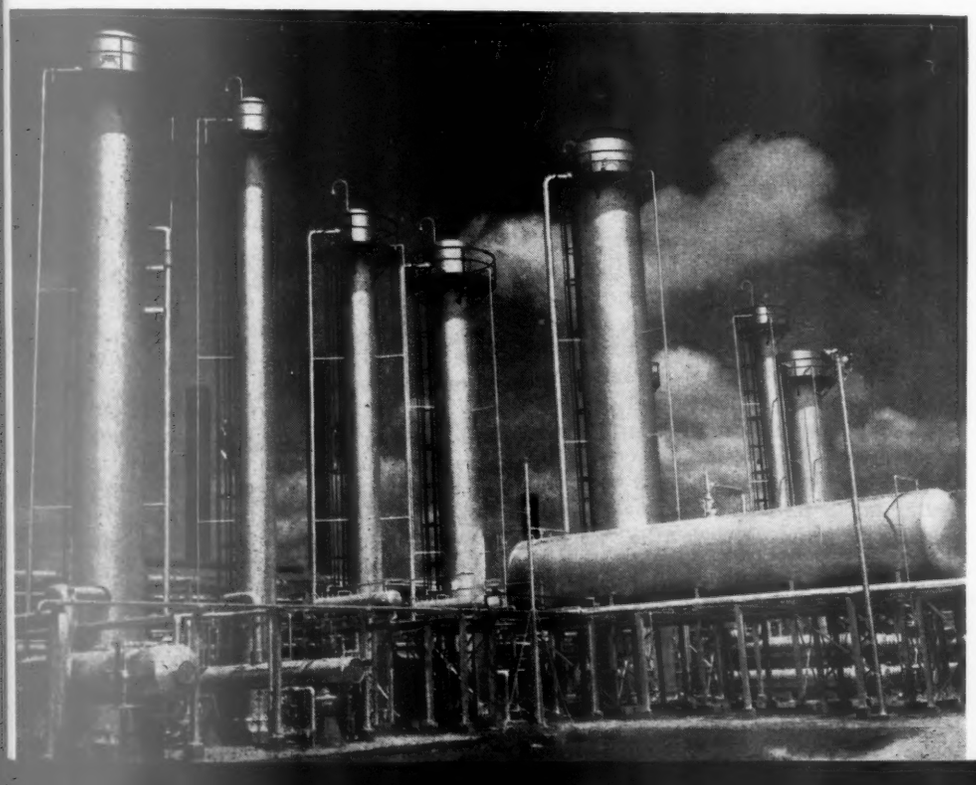
The rich oil pump takes suction on the low pressure flash drum and sends the oil through heat exchangers with outgoing lean oil from the base of the high pressure still to be raised to about 360 F, to a gas heated furnace to reach 450 F, and thence into the high pressure still, operated at about 95 psig. Steam is employed in this still as stripping medium. The overhead products, consisting of a mixture of methane, ethane, propane, iso- and normal butanes and natural gasoline are condensed, gathered in the reflux accumulator and then trapped to the raw products feed tank. Stripped oil from the still bottom exchanges heat with incoming rich oil and then is cooled and sent to lean oil surge tank.

### Scrubber Condensate

Condensate from the field scrubbers, mentioned above, is withdrawn continuously and flashed successively in a 500 psig flash drum, a second operated at 250 psig (intermediate drum) and the final flash is carried out at 100 psig. Vapors from the high pressure drum go to the 500 psig reabsorber, those from the intermediate drum to engine suction, and low-pressure pipe line, and those from the last flash drum go to the 60 psig reabsorber and to boiler fuel.

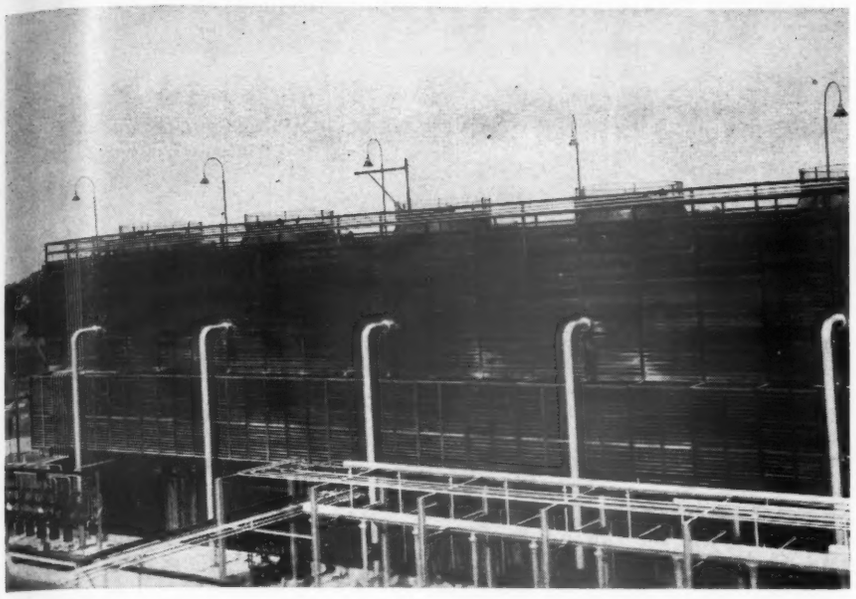
No. 1 liquid condensate enters a pre-heater and into a hot flash tower. The condensate enters a reboiler from which any released vapors re-enter the hot flash tower, and the preheated condensate goes into a fractionator at about 360 F; from this fractionator the bottoms pass into the condensate furnace and are heated to 640 F and again enter the same fractionator. Vapors from the top of this tower are condensed and are stored as motor fuel base. A naphtha side stream, the first drawoff below the tower top, can be made if wanted. Below this, the second tower side stream is kerosine; both these side streams pass into separate strippers that are built into the same column alongside the fractionator tower, where steam strips out the light ends that return to the tower immediately above the drawoff plate in each case. Residue, or bottoms, from this tower becomes diesel fuel of a high cetane rating. The kerosine is used as absorption oil, in addition to being sold as kerosine.

Fractionation equipment at new No. 2 unit.



### Light Ends Fractionation, Plant No. 1

The raw net products liquid is pumped from the accumulator through heat exchange with hot debutanized gasoline from the debutanizer reboiler and into the debutanizer column. This column is operated at 250 psig and a top temperature of 155-160 F; bottom temperature is maintained at 290-295 F. Bottoms from



Forced draft cooling tower.

**TABLE 1. Gas composition of inlet and outlet streams and yields of various hydrocarbons.**

| Hydrocarbon mol per cent | Gas streams: Raw Gas-in | Gas-out Plant 1 | Gas-out Plant 2 |
|---|---|---|---|
| $CH_4$–Methane | 92.95 | 95.06 | 95.78 |
| $C_2H_6$–Ethane | 4.18 | 4.00 | 3.67 |
| $C_3H_8$–Propane | 1.39 | 0.78 | 0.42 |
| i–$C_4H_{10}$–i-Butane | 0.33 | 0.08 | 0.13 |
| n–$C_4H_{10}$–n-Butane | 0.48 | 0.04 | ..... |
| i–$C_5H_{12}$–i-Pentane | 0.15 | 0.04 | ..... |
| n–$C_5H_{12}$–n-Pentane | 0.17 | ..... | ..... |
| Hexanes, plus | 0.35 | ..... | ..... |
| **Gal per MCF** | | | |
| $C_3$– | 0.381 | 0.214 | .115 |
| i–$C_4$– | 0.108 | 0.027 | .042 |
| n–$C_4$– | 0.151 | 0.013 | Nil |
| i–$C_5$– | 0.055 | 0.015 | Nil |
| n–$C_5$– | 0.061 | ..... | Nil |
| $C_6$–plus | 0.161 | ..... | ..... |
| Total, GPM | 0.917 | ..... | ..... |
| Btu/Mft³ | 1107 | 1057 | 1049 |
| Sp. Gr. (Air=1) | 0.6158 | 0.5834 | .578 |

the tower become the debutanized gasoline stream, rectified to such vapor pressure as may be desired by control of the bottoms and reboiler temperatures, and so pass to coolers and to finished storage.

Overhead vapors from the debutanizer go to a condenser and cooler and to the accumulator drum from which reflux for the debutanizer is drawn. The feed pump for the deethanizer takes suction on this accumulator and discharges through a pre-heater where it is heated by either 25-lb or 100-lb steam to about 200 F and then enters the deethanizer tower. Overhead vapors are cooled and condensed, collected in an accumulator that furnishes reflux for the same tower; this tower operates at 465-475 psig with overhead temperature of 150-55 F and bottoms (reboiler) temperature at 225-230 F.

Deethanizer bottoms pass to the depropanizer tower at 250 psig, 123-125 F top and the column bottom at 180-182 F, with reboiler operated at 218 F. Overhead vapors are condensed and become liquefied petroleum gas stock. To separate iso- and normal butane the depropanized bottoms enter a "butane splitter" tower or deisobutanizer, operated at about 100 psig, top temperature 123 F and bottom 132-33 F, and a reboiler at 140-145 F. Overhead is isobutane, disposed of as motor fuel blending fraction, for alkylation stock or to chemical operations. Normal butane bottoms become LPG or other uses for which it is fitted. Terry steam turbines drive the I-R centrifugal pumps for handling strippers and tower bottoms streams.

### Light Ends Fractionation, Plant No. 2

In the new unit, the raw product is fed to the deethanizer after passing through two heat exchangers and exchanging heat with the debutanizer bottoms in one exchanger and the deethanizer bottoms in the second. The feed enters the deethanizer at about 240 F and 550 psig. Overhead vapors from the column, off at 90 F, pass through the reflux condenser, which is cooled with propane as a refrigerant, and into the reflux accumulator. Non-condensable vapors from the reflux accumulator are taken off through the pressure control valve to the fuel gas system.

Bottoms from the deethanizer, containing all the propane and heavier, go at 305 F to heat exchange with incoming raw product and to the depropanizer at about 215 F, entering that column about its midpoint at 225 psig. Propane vapor is taken off the top at 125 F, and to a condenser and cooler through to an accumulator, the overhead vapors from which are transferred to fuel gas lines. This accumulator product furnishes reflux to the depropanizer, the remainder going to LPG storage as propane. Bottoms from the reboiler, at 270 F is transferred to the debutanizer tower at 150 psig; overhead vapors from this column at 138 F are condensed and sent to the reflux accumulator and to LPG storage as butane.

The debutanized bottoms pass out at 260 F, exchange with the raw product stream to the deethanizer where temperature is reduced to 130 F, thence to a cooler and storage as natural gasoline at whatever vapor pressure may be required at the time.

Four field type packaged dehydration units dehydrate gas after absorption.

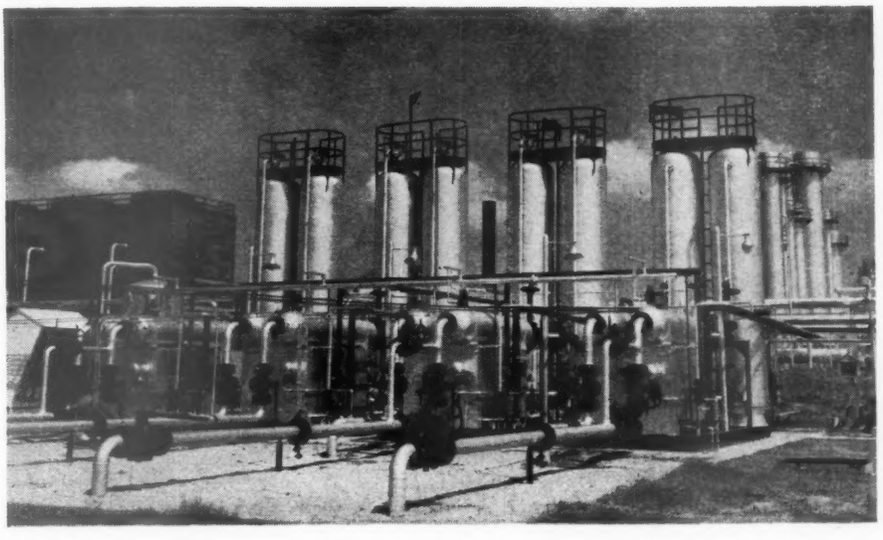


**TABLE 2. Analyses of raw condensates.**

| Hydrocarbons | Streams, per cent Sampled at 1100 psig | Sampled at 50 psig |
|---|---|---|
| $CH_4$ | 16.89 | 2.86 |
| $C_2$ | 7.36 | 4.25 |
| $C_3$ | 5.18 | 6.98 |
| i-$C_4$ | 2.83 | 3.79 |
| n-$C_4$ | 3.00 | 6.77 |
| i-$C_5$ | 4.18 | 5.38 |
| n-$C_5$ | 3.71 | 3.32 |
| $C_6$-plus | 56.85 | 66.65 |
| Sp. Gr. | ..... | 0.700 |
| API Gr. | ..... | 70.6 |
| Yield; Motor fuel base, per cent | ..... | MM Octane No. 75.0 |
| Natural gasoline | ..... | 45 Approx. ..... |
| Kersoine | ..... | 72 Approx. 20.0 |
| Residue | ..... | 1.0 |

**TABLE 3. Throughputs and yields, No. 1 Plant**

| | Per cent | Amount, cu ft per day |
|---|---|---|
| Gas, max. feed rate | 108 | 108,572,000 |
| Total fractionator charge. | ... | 131,663 gal per day |
| Motor fuel, avg. prod. | ... | 93,031 gal per day |
| Kerosine, avg. prod. | ... | 22,131 gal per day |
| Residue | ... | 2,271 gal per day |
| Natural gasoline, avg. prod. | ... | 45,920 gal per day |
| N-Butane | ... | 12,431 gal per day |
| I-Butane | ... | 9,757 gal per day |
| Propane | ... | 13,746 gal per day |
| Liquefied petroleum gas (n—$C_4$+$C_3$) | ... | 26,177 gal per day |
| Finished motor gaso. per mo. | ... | 3,803,719 gal per mo |

## Condensate Fractionation, Plant No. 2

Intermediate pressure condensate is transferred to the flash drum from the make tank, and the vapors therefrom are processed further in the intermediate pressure reabsorber. Liquid from this flash drum enters the top of the stripper column at 75 F and 115 psig; overhead vapors go to the 100-lb reabsorber, while the stripper bottoms liquid, at 200 F, enter the side of the condensate stabilizer at 100 psig. From this stabilizer the overhead vapors come off at 300 F, are condensed and pass to the accumulator and to the raw product feed tank enroute to the light ends cycle described above. From the stabilizer reboiler the bottoms, at 410 F, are heated to 525 F and enter the motor fuel base fractionator. Overhead vapors from this fractionator come off at 370 F, are condensed in a Fintube air cooler and go to storage as motor fuel base product. The fractionator bottoms are heated in the kerosine heater furnace at 575 F, are flashed in a tower and overhead vapors are taken off at 480 F, condensed and stored as kerosine. Steam at 420 lb per hr is injected into this tower for stripping. The tower bottoms are withdrawn from the reboiler, cooled, and sent to storage as diesel fuel or other uses for which it is suitable.

General view, showing storage area for finished products.

## Storage Facilities

Obviously, a plant with such large quantities of intermediate and finished products, and a long list of different products, must provide a great number of tanks, drums, and other storage and surge containers. Storage at this plant includes 8 Hortonspheres for LPG storage for a total of 612,000-gal capacity. Propane pressure storage totals 140,000-gal, and natural gasoline uses 625,000-gal total capacity. In addition, the finished motor fuel production required 60,000 bbl or 2,500,000 gal, with kerosine needing 1,000,000 gal in addition.

All finished gasoline leaves the plant via pipe line; other products are shipped via railroad tank car from a rack affording 32 car "spots." Complete tetraethyl lead facilities are provided to blend finished motor gasoline of any required octane rating.

The laboratories include one unit for manufacturing control, and one unit for testing products. In the test unit are included one motor method octane rating engine unit and a similar one for research method ratings. A Pod Hyd-Robot analytical unit is installed for gas analyses. Laboratory and loading section requires the services of 21 men; 84 persons are on the entire plant payroll.

One interesting item in the plant's operation is that the propane and butane streams are pure hydrocarbons in terms of commercial product specifications, which allow 5 per cent contamination with other hydrocarbons, therefore, these streams *can* be sold as commercial CP products, if desirable.

Three deep water wells supply the plant with required water; two of these wells have high $MgCO_3$ and Ferric iron hardness, while the third well is better. A sodium zeolite treatment is installed. Also, recently a filtering and settling unit has been built for settling and aerating boiler make-up water; this water is further treated "internally," with phosphates, sulfates, and caustic soda, along with quebracho tannin treatment. Each well requires a different formula, as solute concentrations vary. * * *

End view of direct-fired oil heaters.

# THE TECHNICAL FORUM

***Questions on the petroleum and natural gas industries' technology, chemistry, engineering, and operating problems are answered each month by widely recognized authorities.***

## Determination of Catalyst Activity

**Q What methods may be employed to determine relative activity and activity life of cracking catalysts, according to the best usages of the industry at present?**

*F. W. F.*

A Relative activity of a catalyst may be defined as the ratio of the space velocity of the catalyst under test to the space velocity required for the standard catalyst to give the same conversion as the catalyst being tested. In most cases the ratio is multiplied by 100 before being reported.

Practically all of the bench scale fixed bed, or fluidized bed, activity tests can be used to give a relative activity figure. For this purpose a curve such as in Fig. 1 is used. This chart shows a base reference curve of the hourly weight space velocity versus conversion for one type of standard reference catalyst. Reference curves for each test unit and reference catalyst should be obtained since pilling (if called for by the test), temperature gradients in the reactor, gas oil difference and many other variables will affect the results.

Fig. 1 is based on a two hour 200 cc test for pilled natural catalyst and was established by running the standard catalyst under a variety of conditions; reactor temperature is 850 F and 200 cc of the standard catalyst, when pilled, usually give about 0.72 space velocity; therefore, the reference condition has been taken as 51 per cent conversion. When testing fresh catalysts, the usual practice is to compare space velocities at 51 per cent conversion. Therefore, the relative activity for a production composite of catalyst manufacture might be as follows:

| Catalyst— | Reference | Production composite |
|---|---|---|
| Space velocity of test | 0.75 | 0.69 |
| Conversion— observed | 50.2 | 53.0 |
| Space velocity at 51% conv. | 0.73 | 0.75 |

Relative activity $\frac{0.75}{0.73}$ by $100 = 103$

The production composite gives 103 per cent relative activity compared to the reference tested at the same time. It is believed that most laboratories run the reference sample periodically and use the space velocity that is determined by drawing a line parallel to the base reference line, then taking the space velocity given at the intersection of this drawn line and the arbitrarily selected conversion level. This procedure avoids the lost time connected with running a reference sample every time a test is made, but still shows up changes in the conversion-space velocity relationship that may occur over a long period of time.

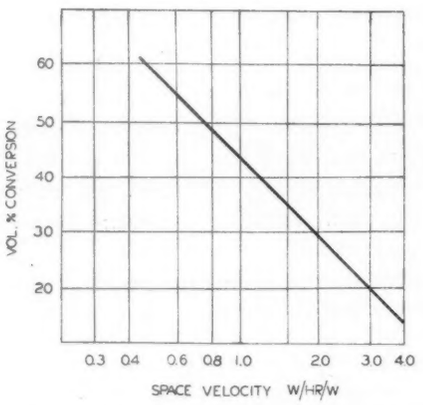



FIG. 1. Space velocity-conversion reference curve.

With used catalyst, or aged and contaminated catalyst, the slope of the conversion-space velocity relationship is not the same as for fresh catalyst. Therefore, instead of relating the activities at a standard conversion level, a line parallel to the reference line is drawn through the datum point for the reference sample to the same conversion as observed for the sample being tested.

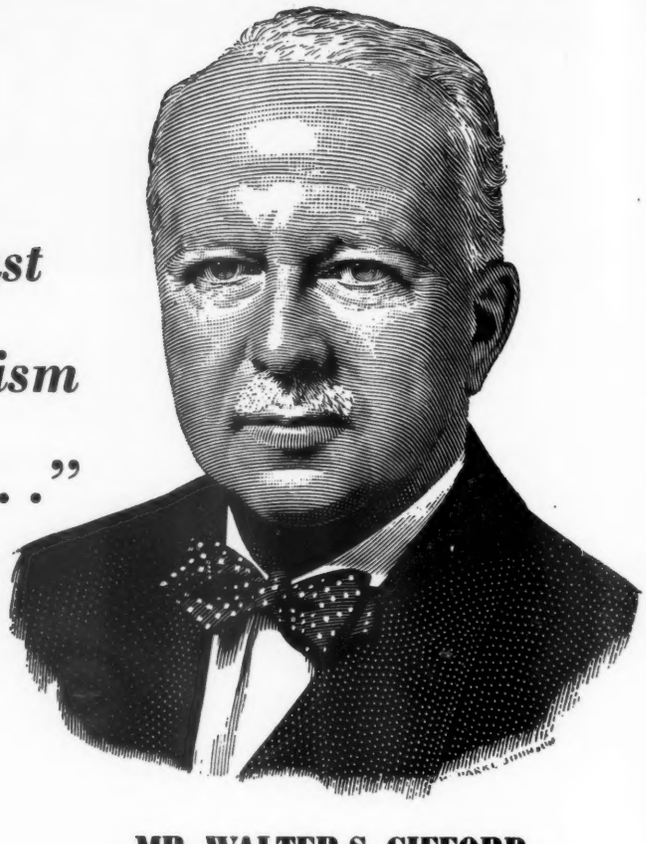
For example:

| Catalyst— | Used | Reference |
|---|---|---|
| Space velocity | 0.65 | 0.75 |
| Conversion— observed | 30.0 | 50.2 |
| Space velocity at 30.0 Conv. | 0.65 | 1.91 |

Relative Activity of Used = $\frac{0.65}{1.91}$ by $100 = 34\%$ reference.

Although the activities have been reported as 103 and 34, it should be borne in mind that the errors in measuring conversion and space velocity do not justify the indicated accuracy, particularly when the catalyst must be pilled for test. It was noted in the case of one catalyst of a 100 relative activity, that doubling the pill length reduced the relative activity by 10. Hence, correction factors for pill length and density should be established for the test unit and type of catalyst. Even though relative activity will probably not give as consistent results as D + L or per cent gasoline, for example, it is felt to be better to measure the ability of a catalyst to convert gas oil than it is to determine the activity by a single value of prod-

*"The immunizer against the disease of communism is a certain feeling . . ."*



**MR. WALTER S. GIFFORD**

**"It is the feeling of a man who owns a home, a bank account, an insurance policy. *It is the feeling that an employee on the Payroll Savings Plan has when he gazes at his accumulation of Savings Bonds and realizes that here is palpable evidence that he has made a profit on his job—that the profit system works for him as well as for his employer.*"**

Mr. Gifford has believed in—and worked for—payroll savings plans for thirty-seven years—since 1913, when, as Statistician of the A. T. & T., Mr. Gifford developed a payroll savings plan for the purchase of A. T. & T. stock.

In 1938, A. T. & T. employees were offered a Payroll Savings Plan for the purchase of U. S. Savings Bonds. To date, Bell System employees have invested ***more than half a billion*** dollars in savings bonds—with a maturity value in excess of $675,000,000.

In upwards of 21,000 large companies, more than 8 million Americans are investing $150,000,000 in U. S. Savings Bonds ***every month.*** To the systematic saving of these men and women—and the whole-hearted co-operation of executives like Mr. Gifford—is due in no small measure the important feeling of ownership shared by the Americans who own 56 billion dollars in U. S. Savings Bonds (against 45 billions at the end of the war!).

Every Payroll Savings Plan is a reflection of the vision and enthusiasm of the top executive of the company. If he gets behind it, ***personally,*** employee participation is high—to the benefit of the country, the company and the employee. If the interest of the Big Boss is active—participation may very well exceed the 50% mark. The top man is the key man in a Payroll Savings Plan.

Get in touch with your State Director, Savings Bond Division, U. S. Treasury Department. He will help you put in a plan . . . or he will show you how to increase employee participation—without undue effort or high pressure tactics.

**The U. S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the G. M. Basford Company and**

uct distribution such as per cent gasoline. Furthermore, relative activity has the advantage that it can be directly related to the actual unit activity that is discussed later.

Catalyst selectivity is as important as activity and in fluid unit operation may be more important as the majority of such units are operating at either a gas or coke limitation whereas very few operate at an activity limitation. Also, relative activity gives no indication of contamination whereas selectivity does. By bench scale tests the gas and carbon producing factors may be determined and related to the commercial operation. To obtain these factors, the gas in cubic feet per barrel of feed for the standard or reference catalyst is determined over a fairly wide range of conversion. The carbon-conversion relationship is also obtained. The gas factor is then the ratio of volume of gas produced by the catalyst under test to the amount of gas which would be produced by the reference catalyst at the same conversion as observed for the catalyst being tested. Carbon factor (CPF) is the ratio of the carbon produced by the catalyst being tested to the carbon which would be produced by the standard at the observed conversion level.

Relative activity plus CPF and GPF gives a fairly complete index of cracking characteristics of the catalyst. As with relative activity the CPF and GPF accuracy may be improved by correction factors for pilling. Where powders are used, corrections are necessary for pressure build-up and these must be determined for each catalyst and test unit.

In regard to the selection of the best method for determining relative activity, there are a number of different methods[1] used for testing fluid catalyst and the prospective user will have to select the best test suited for his particular needs. The CAT A test[2] is the accepted standard test for checking TCC catalyst. Only one of the tests, so far as the writers know, provides for the use of steam. As steam can raise the activity of aged natural catalyst roughly 10 per cent while not appreciatively affecting synthetic under the same conditions, it can be seen that determination of make-up to maintain a certain activity level might be influenced by the fact that the test omitted steam. Also, it is the feeling of the writers that long process periods are to be avoided since the effect of carbon build-up on the catalyst during the lab test may be different than the effect commercially.

The activity of a catalyst in the commercial unit or "unit activity" may be obtained by comparing the space velocity at the same holding time and conversion, catalyst circulation rate being increased to give the same holding time. If the initial space velocity was 3.4 for 60 per cent conversion and one minute holding time whereas 1000 hours later it was 1.7 for 60 per cent conversion and one minute, the unit activity would be $\frac{1.7}{3.4} \times 100$ or 50 per cent. Naturally feed stock, reactor temperature, superficial reactor velocity, and carbon on regenerated catalyst must be the same in the two cases. As this is rarely the situation in commercial operation, "unit activities" are seldom obtained. In one semi-commercial run, however, the relative activity and unit activity were equivalent if the relative activity was based on the space velocity and conversion of the catalyst taken from the semi-commercial unit during the initial unit activity test period.

Some refiners are substituting factors based on hydrogen in the dry gas for lab determined CPF and GPF, and several successful correlations for commercial gas and carbon make have been based on such plant factors. The main advantage of these plant factors is that they are not dependent on a secondary test. Also, the gaseous products are made with catalyst that contains the average amount of carbon rather than starting at essentially zero carbon and going up to a relatively high value, as in many laboratory tests.

The activity life or, aging characteristics of a catalyst are determined best by controlled methods that are the closest possible approach to commercial operation. This means that a pilot unit operation is desirable wherein cracking conditions, regeneration, steam rates, etc., are a close approximation of average commercial operation. The feed stock used is quite important as contaminants in the feed may have a large bearing on the decline in activity and selectivity of a catalyst over an extended period of test. In checking the aging characteristics of a catalyst, some reference base is required, such as a similar pilot plant run with a reference catalyst whose commercial performance has been established. The period of test should be such that the rate of decline of activity and selectivity is satisfactorily established or can be safely interpolated to a desired age. Pilot plant runs in equipment charging two to four barrels per day are expensive and it is often desirable to obtain an approximation of activity decline through the use of smaller equipment such as the automatic catalyst aging unit[3] or the recently developed "Midget" pilot fluid unit[4]. The bench scale activity test units are unsatisfactory, generally, for determining activity decline.

### References


1. (a) Proceedings 27th Annual Meeting API, Section III Refining, November 10-13, 1947.
   (b) "Activity Test for Fluid Cracking Catalysts," UOP Method, M-251-441, Universal Oil Products Co.
   (c) M. E. Conn & C. G. Connely, "Testing of Cracking Catalysts," Ind. Eng. Chem. 39, 1138-43 (1947).
2. J. Alexander and H. G. Shimp, "Laboratory Method for Determining the Activity of Cracking Catalysts," Natl. Petroleum News, 36 (31) R-537-8 (1944).
3. Proceedings 27th Annual Meeting API, Section III Refining, P. 84, November 10-13, 1947.
4. H. W. Grote & J. Hoekstra, "Midget Fluid Catalytic Cracking Units Utilize Fluid Catalytic Cracking Technique on Laboratory Scale," General Papers, ACS, Div. Pet. Chem., March 26-30, 1950.



*R. C. Davidson*
*Roger S. Shute*


## Continuous vs. Batch Grease Making

**Q What are the advantages and disadvantages of a continuous process for grease making? We are interested in both the technical and operating angle of this type of process as well as the economics of the operation, along with some information regarding the comparative quality of the products made as compared to a batch type process.**

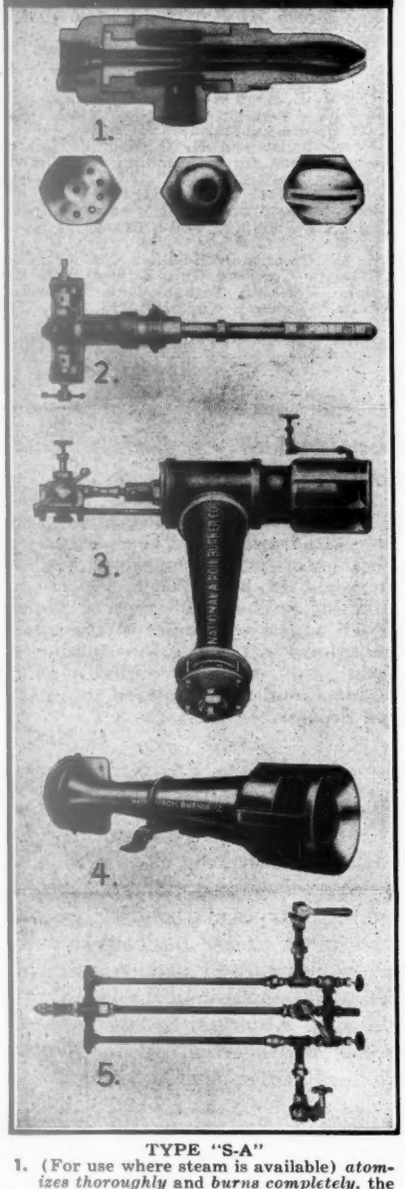
***C. M. C.***

A The first things to consider in comparing continuous with batch grease making are the quantity of grease to be manufactured and the number of types and grades. The manufacture of grease basically involves the manufacture of a soap either from fats or fatty acids and the blending of this soap homogeneously with the proper hydrocarbon oil to give the grade of grease desired.

The average grease plant will manufacture from 200 to 400 different grades and types of grease. Each of these products will involve the use of different raw materials compounded with varying formulations. It is therefore, quite clear that to attempt to manufacture such a large variety of products continuously introduces complications, the most important of which are control of the ingredients and purging of the system.

In some cases where process is called "continuous" soap and oil are mixed continuously where large quantities of a single type of grease are required and where grade is the principle variable. In these operations the soap making step is batch and the continuous operation is that of mixing the soap and the hydrocarbon oil. In such an installation the efficiency of the process is very dependent upon the type of saponification equipment used. If soaps are made under pressure with efficient mixing equipment from 10 to

THE *RIGHT* OIL BURNER OR GAS BURNER *FOR YOUR JOB*




TYPE "S-A"

1. (For use where steam is available) *atomizes thoroughly* and *burns completely*, the lowest and cheapest grades of fuel oil and tar, requiring only low oil pressure and temperatures. Send for Bulletin No. 21.

TYPE "S-A-L"

2. (Large capacity burner similar to TYPE "S-A-R") is adaptable in combination with powdered coal burners in large boilers. Send for Bulletin No. 24.

COMBINATION GAS AND OIL BURNER

3. —the "AIROCOOL" Gas Burner in combination with a TYPE "S-A-R" Oil Burner. Send for "Airocool" brochure.

"AIROCOOL" GAS BURNER

4. (Of venturi type) assures low turndown without burnback. Send for "Airocool" brochure.

TYPE "S-A-D"

5. (Refuse Oil Burner) burns acids or caustic oils, sludges, asphalts, tank bottoms, polymer oils, heavy petrolatum, organic oil residuums, waste cutting oils, sulphite pulp liquors, tars, pitches, etc., in combination with fuel oil. Send for Bulletin No. 21.

NATIONAL AIROIL BURNER CO., INC.

Main Offices and Factory:
1259 E. SEDGLEY AVE., PHILADELPHIA 34, PA.
Southwestern Division: 2512 South Boulevard
Houston 6, Texas


**AN INVALUABLE SERVICE**

This Forum is a meeting place each month for engineers, technologists, students, operators, etc. Each may profit by answers to his own knotty questions and those of others. Answers are supplied by the leading scientists and engineers in the world of oil and gas. Address all questions to **Technical Forum Editor, Box 1589, Dallas 1, Texas.** Send them in right away while you think of it.

30 per cent less soap will be required for a given grade of grease than if inefficient soap making equipment is used. It is clear that the fact that the oil and soap may be blended continuously has little affect on the saponification.

Greases can be manufactured with greater precision and uniformity if all ingredients are weighed. Although this can be done in continuous processing it would be difficult to operate a continuous saponification step where the soaps are made under pressure and where dry caustic soda and dry lime are used. Dry lime and dry soda can be advantageously used where adequate mixing is provided in the saponification step and by so doing the water content of the grease is more easily controlled and the quantity of water to be removed in the case of soda grease is considerably less than where aqueous solutions of caustic soda are used. It is evident that for the saponification step at least the batch process has a number of advantages over continuous process.

In the blending of the soap and oil it is possible in most cases by conversion to modern short-time cycle batch methods to manufacture the desired quantity of grease in any given grease plant during the 40-hr work week. By manufacturing during the daylight hours the personnel problem is simplified, especially that of supervision, and this type of operation usually results in very few, if any, batches that require reworking. It is common experience that a large percentage of the batches requiring reworking are made in the afternoon or night shifts when supervision is not generally at its best.

We see no reason why a system could not be devised that in reality would be a continuous system for the manufacture of grease that would give a product equal in quality to that possible in a batch system. For the reasons stated above, however, we do not believe that the average requirement is sufficiently large in quantity to justify such attempted installation that at best is difficult to control in so far as type and grade are concerned. A batch system designed with the various pieces of equipment properly proportioned, one to the other, is in reality a system in which all equipment operates a very high percentage of the time and may be termed a batch system in constant use.

*J. A. Altshuler.*

## Natural Gasoline Recovery

**Q What are the essential differences in required equipment, and in the controlling operating conditions, in natural gasoline plants designed for (a) 75 per cent $C_4$ and (b) 90-95 per cent $C_4$ recovery?**

*M. D. C.*

A A plant designed for 75 per cent $C_4$ recovery generally contains the following units: High pressure absorber, reabsorber, absorption oil still, deethanizer, depropanizer (if a separate $C_3$ product is required), debutanizer, plus appropriate condensers, oil heat exchangers, etc. Recovery of 90-95 per cent $C_4$ could be obtained with the same series of operations simply by designing for a much higher oil circulation with bigger equipment and by changing operating conditions at certain points. This is not economical, however. Substantial savings in oil circulation and in utilities may be effected by changing the process and equipment somewhat.

*Absorber.* Due to losses elsewhere, a high pressure absorber must recover a percentage of $C_4$'s higher than the over all plant recovery. Thus, at 75 per cent net recovery, perhaps 85 per cent of $C_4$'s must be absorbed; at 90-95 per cent net recovery, nearly 100 per cent must be absorbed. When approaching 100 per cent recovery of any component, required oil circulation becomes very sensitive to the number of absorber trays. Consequently, a taller absorber is recommended for the high recovery plant, say 24 trays as compared with 16 for the lower recovery rate. In addition, intercooling of the trays is desirable at high recoveries because of increased heat of absorption.

*Oil Distillation.* The absorber will absorb perhaps 50-75 per cent more $C_1$ and $C_2$ at the higher recovery. The problem of eliminating the increased quantity of these undesirables combined with the difficulty of retaining a very high percentage of the absorbed $C_4$'s and heavier accounts for the differences in the two plant processes. Even after the elimination, through a reabsorber, of considerable $C_1$ and $C_2$, the charge to the fractionators in a high recovery plant will have a high vapor pressure. To cope with this prob-

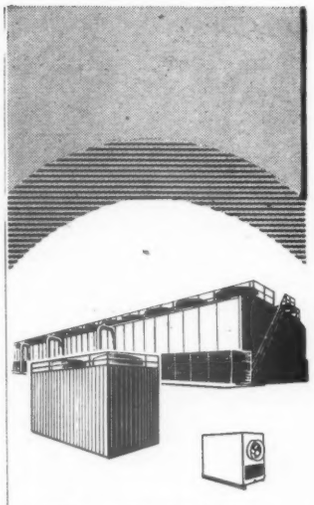
lem there are 3 alternatives: (a) Run the absorption oil still at high pressure (say 150 psig as compared with 60 psig in the low recovery plant) with a consequently large stripping steam requirement; (b) operate the still at normal pressure and install a large recompressor to boost part of the fractionator charge in a vapor state; or (c) partially strip the rich oil in a primary still operating at high pressure, and complete the stripping in a secondary still operating at low pressure with totally condensing overhead. (Typical operating conditions might be 125-150 psig in the former and 10-40 psig in the latter.)

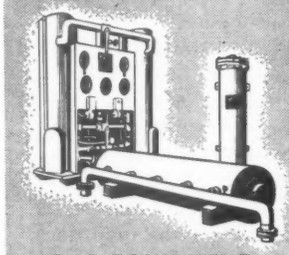
Recent design trends have tended toward alternatives (a) and (c). If, as in (a), a single high pressure still is used, rich oil should be heated in a direct fired furnace rather than in a steam coil. The high temperatures made possible by furnace operation will prevent excessive stripping steam consumption. Typical conditions at the base of the still in the high and low recovery plants might be, respectively: 125-150 psig, 450-550 deg and 50-70 psig, 350-400 deg.

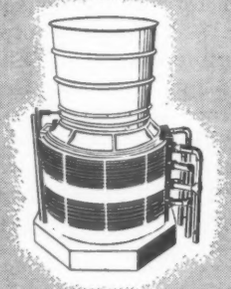
*Oil Stabilizer.* Very good results may often be obtained by substituting a rich oil stabilizer for the reabsorber. This makes possible the elimination of much more $C_1$ and $C_2$ at an early point in the process and permits lower pressure operation of the absorption oil still. A rich oil stabilizer is a bottle-shaped tower containing 30 or 40 trays, refluxed at the top with lean oil, reboiled at or near the base, and fed near the middle with rich oil. Such a tower is probably not necessary in the 75 per cent $C_4$ recovery plant. In the 90-95 per cent recovery plant, however, a rich oil stabilizer may be extremely desirable, particularly if $C_3$ is to be recovered only incidentally. For, if a large amount of $C_3$ may be permitted in the stabilizer overhead residue, substantially all the absorbed $C_2$ may also be eliminated at this point and thus no deethanizer column will be required ahead of the fractionators. By designing the stabilizer for flexibility, allowance may be made for future increased recovery of $C_3$. Thus, instead of cutting between $C_2$ and $C_4$ as at present, changed operating conditions plus increased refluxing would permit the tower to cut between $C_2$ and $C_3$. In addition, a deethanizer might be installed at that time.

Operating conditions in rich oil stabilizers vary greatly depending on the service. Roughly speaking, such towers operate between 150 and 250 psig with 300 to 400 deg base temperatures.

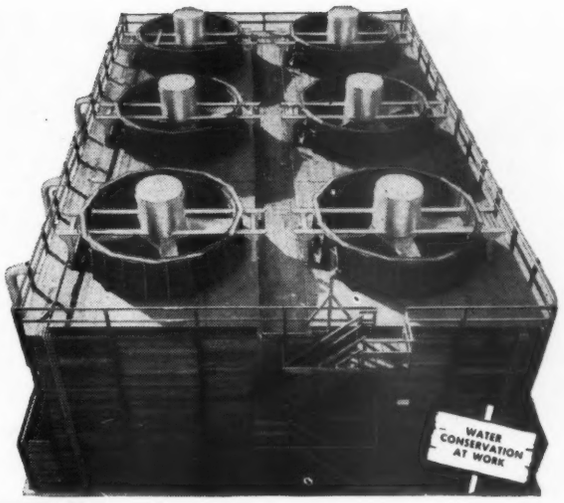
*Alan S. Glendening.*



COOLING TOWERS


GAS EQUIPMENT


AIR COOLED HEAT EXCHANGERS

Producers of QUALITY Specialized Process EQUIPMENT




Pritchard

INDUSTRIAL COOLING TOWERS Help You Save Water!

Wherever heat is to be dissipated to the atmosphere, you can depend on a Pritchard Cooling Tower to do the job more efficiently and economically at *water savings up to 99% over former wasteful methods!*

Adequately sized, thoroughly engineered and manufactured of highest quality materials, Pritchard Towers are guaranteed to meet your peak as well as your normal load requirements. Wherever you see a Pritchard Cooling Tower, you see water conservation at work.

Consult your nearby Pritchard representative for the solution to your water conservation problem.

**Write for *FREE* Bulletins**

EQUIPMENT DIVISION
J.F. Pritchard & Co.
Dept. No. 50 908 Grand Ave., Kansas City 6, Mo.

District Offices: CHICAGO • HOUSTON
NEW YORK • PITTSBURGH • TULSA • ST. LOUIS
Representatives in Principal Cities from Coast to Coast

# NEWS

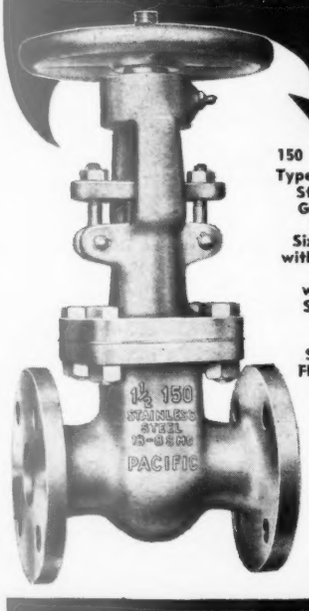
## Cities Service to Raise Refining Capacities

An expansion and modernization program for the Cities Service refinery at Ponca City, Oklahoma, was announced by A. W. Ambrose of Bartlesville, president of Cities Service Oil Company (Delaware). The announcement indicated from one to two years will be required to complete the program. The new facilities will include a catalytic cracking unit of latest design, a catalytic polymerization unit, and a gas plant. The program also will include revision of the vacuum flashing unit, treating processes, installation of a new water cooling tower, increased storage capacity for finished products, and additional steam, water and other facilities.

The present crude processing unit will be revamped to provide a 33 per cent increase in capacity, to 20,000 bbl of crude oil daily. It will be operated in conjunction with the vacuum flashing unit, which will use residuum as feed stock and produce gas oil feed for the cat cracker and a product used in blending heavy fuels. The catalytic cracking unit will be the fluid type and will replace the present thermal cracking units.


PACIFIC'S NEW
Stainless Steel Gate Valves

SEND FOR BULLETIN




150 Lb. 600 Lb.
Type 316 or Alloy 20 Stainless Steel GATE VALVES
Series 150: Sizes ½" to 8" with Flanged Ends ½" to 2" with Screwed & Socket Welding Ends
Series 600: Sizes ½" to 2" Flanged, Screwed or Socket Welding Ends

PACIFIC VALVES, INC.
3201 WALNUT AVE., LONG BEACH 7, CALIFORNIA
TELEPHONES: L.B. - 40-5451; Los Angeles - NEvada 6-2325
TELETYPES: L.B. - 8-8076; New York City - 1-1077
Offices: San Francisco, Calif.; Houston, Texas; Chicago, Illinois; Salt Lake City, Utah; Denver, Colo.; Beaumont, Texas; Pittsburg, Pennsylvania; Cleveland, Ohio; Seattle, Washington; New York, N. Y.; St. Louis, Missouri; Tulsa, Oklahoma


## British Refinery Designed

Construction is expected to get under way late this fall on the 20,000-bbl daily capacity refinery that Socony-Vacuum Oil Company, Inc. and Powell Duffryn, Ltd. have announced they will build in England. The refinery will be a complete processing unit, though specializing in the production of lubricating oils. The plant site will be at Coryton about 25 miles below London Bridge on the Thames.

## Conoco to Supply Avgas

Continental Oil Company will supply the Navy with 2750 to 4000 bbl of 115- to 145-octane aviation gasoline daily beginning November 1. To make the high-octane gasoline, Conoco is modifying its Ponca City, Oklahoma refinery, the first plant to make and blend 100-octane gasoline in Oklahoma and the Southwest during World War II, H. G. Osborn, vice president, stated.

## Filtrol Catalyst Plant

Filtrol Corporation reports that construction on the new $3,000,000 Filtrol Salt Lake, Utah manufacturing plant is well under way. The new plant will be capable of making a full line of Filtrol products but is especially designed for the manufacture of an improved new catalyst for petroleum cracking. This superior catalyst is particularly suitable for the manufacture of high octane gasoline and will promote major economies in those refineries that generally require a catalyst of the synthetic type.

The new Filtrol Salt Lake City plant is scheduled for operation early in January. Manager of Salt Lake plant will be Arthur D. Yates, who previously was superintendent of the Filtrol California plants. His technical adviser will be Warren Havell, also of Filtrol's Los Angeles personnel. Initial quota of personnel for the operation of the new Filtrol Salt Lake plant is estimated at approximately 150 in direct plant operations.

## WPRA to Meet in Casper

The Western Petroleum Refiners Association will hold a two-day regional meeting in Casper, Wyoming on October 12 and 13. John C. Day, Association secretary, has announced that the meeting will consist of both technical and industrial relations sessions. It will be held at the Gladstone Hotel. Day said that the first day of the October meeting will be given over to discussion of refinery labor problems and other industrial relations matters. The second day will be devoted to technical papers and the discussion of technical problems.

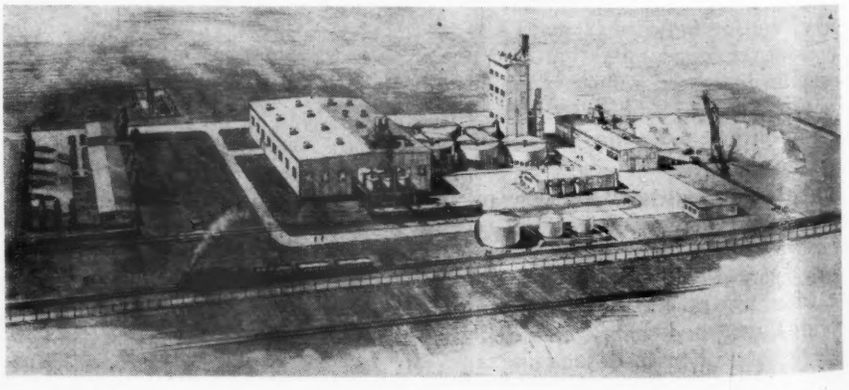
## Odorless Paint Solvent

Shell Oil Company has completed a new plant specifically designed to produce solvents for odorless paint. Situated at the company's Wood River, Illinois refinery, the new solvent unit will materially augment the supply of a product in great demand by the paint industry. According to Fred Preu, assistant manager of Shell's special products department in New York, the new solvent is only available at the present time in tank car quantities. However, the company will provide individual drums for testing purposes until such time as arrangements can be completed for tank wagon and drum distribution through distributors.

## Mid-West Refinery To Get Platforming

Mid-West Refineries, Inc., has begun construction of a 1500-bbl per day platforming unit at its refinery at Alma, Michigan. Installation of the platforming unit is one part of an expansion program being carried out by Mid-West. In this program, capacity of the refinery is being increased from 4200 bbl a day to 10,000 bbl, E. E. Thompson, superintendent of the refinery stated. He added that Mid-West marketing operations have exceeded capacity of the refinery and the improvement program accordingly will supply both requirements.

Engineering drawing of new Filtrol Salt Lake City plant.



MODEL 21-103 ANALYTICAL

# MASS SPECTROMETER

## *for Chemical Analyses*

**of all classes of liquids and gases**

— COMPLEX MIXTURE ANALYSES
— IMPURITY DETERMINATIONS
— EXPLORATORY ANALYSES
— CONTROL ANALYSES

### *The* ISATRON

The completely new ion source, ISATRON, and analyzer offer exceptional sensitivity (10 parts per million), extended mass range (1 to 400), with adjustable resolving power during actual operation.

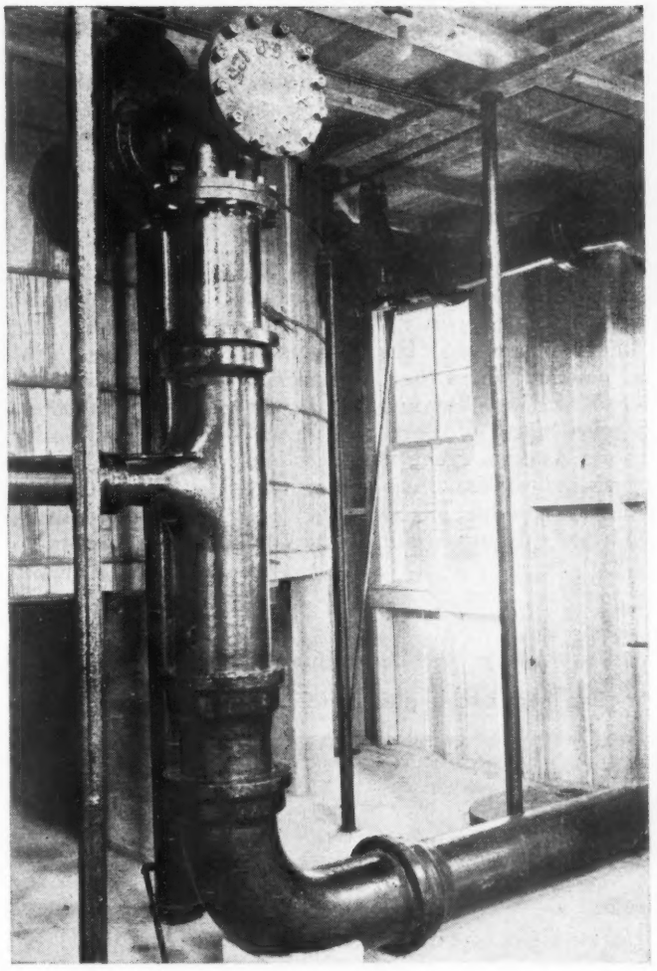
### *The* MICROMANOMETER

The sample introduction system uses metal valves and features the MICROMANOMETER for direct pressure measurement, thus increasing accuracy and speed of sampling.

These, and many other outstanding features including improved circuits and controls, insure the utmost in usefulness and flexibility, ease of operation, and maintenance.

For further information, write for Bulletin CEC-1800-X16

CONSOLIDATED ENGINEERING CORPORATION
*Analytical Instruments for Science and Industry*
620 NORTH LAKE AVENUE, PASADENA 4, CALIFORNIA



## DIRECT ROUTE TO LOWER PLANT MAINTENANCE

**The direct and indirect expense of replacements of short-lived refinery pipe lines can be reduced, or avoided altogether, by the use of cast iron pipe. This has been proved by many refineries whose maintenance costs have been lowered by replacing other pipe materials with cast iron.**

**A relatively low first-cost material, cast iron pipe is usually cheapest in the end, for many refinery applications, because of its stubborn resistance to corrosion. Available with bell-and-spigot, plain end and flanged, or with standardized mechanical joints.**

**Cast Iron Pipe Research Association,**
**Thomas F. Wolfe, Engineer,**
**1015 Peoples Gas Bldg., Chicago 3, Illinois.**

CAST IRON PIPE
FOR LONG LIFE AND ECONOMY

# Bordeaux Refinery Completes 2-Year Plan

The Caltex refinery near Bordeaux, France, has reached capacity processing of 14,000 bbl daily, thus climaxing a two-year reconstruction costing more than $8,000,000, according to W. H. Pinkard, chairman.

The 16-acre plant is owned by Raffineries de Petrole de la Gironde, the well-known French company in which Catlex has an interest. It is situated on a finger of land near Bec d'Ambes at the junction where the Garonne and Dordogne Rivers flow into the Gironde 15 miles north of Bordeaux. It will process Arabian crude into gasoline, kerosine, diesel gas oil, as well as light and heavy residual oils for fuel.

Virtually destroyed during the war, the Gironde refinery was rebuilt as part of France's so-called Monnet plan, Pinckard said. This plan provided for restoration of four large capacity refineries at strategic points throughout France.

Present production plans call for a yearly production of 600,000 tons of petroleum and products—more than double the plant's pre-war output. Aside from rehabilitating 410,000 bbl tankage already on the site, an additional 960,000 bbl of tank capacity have been built. It has 340 local and 4 American employees.

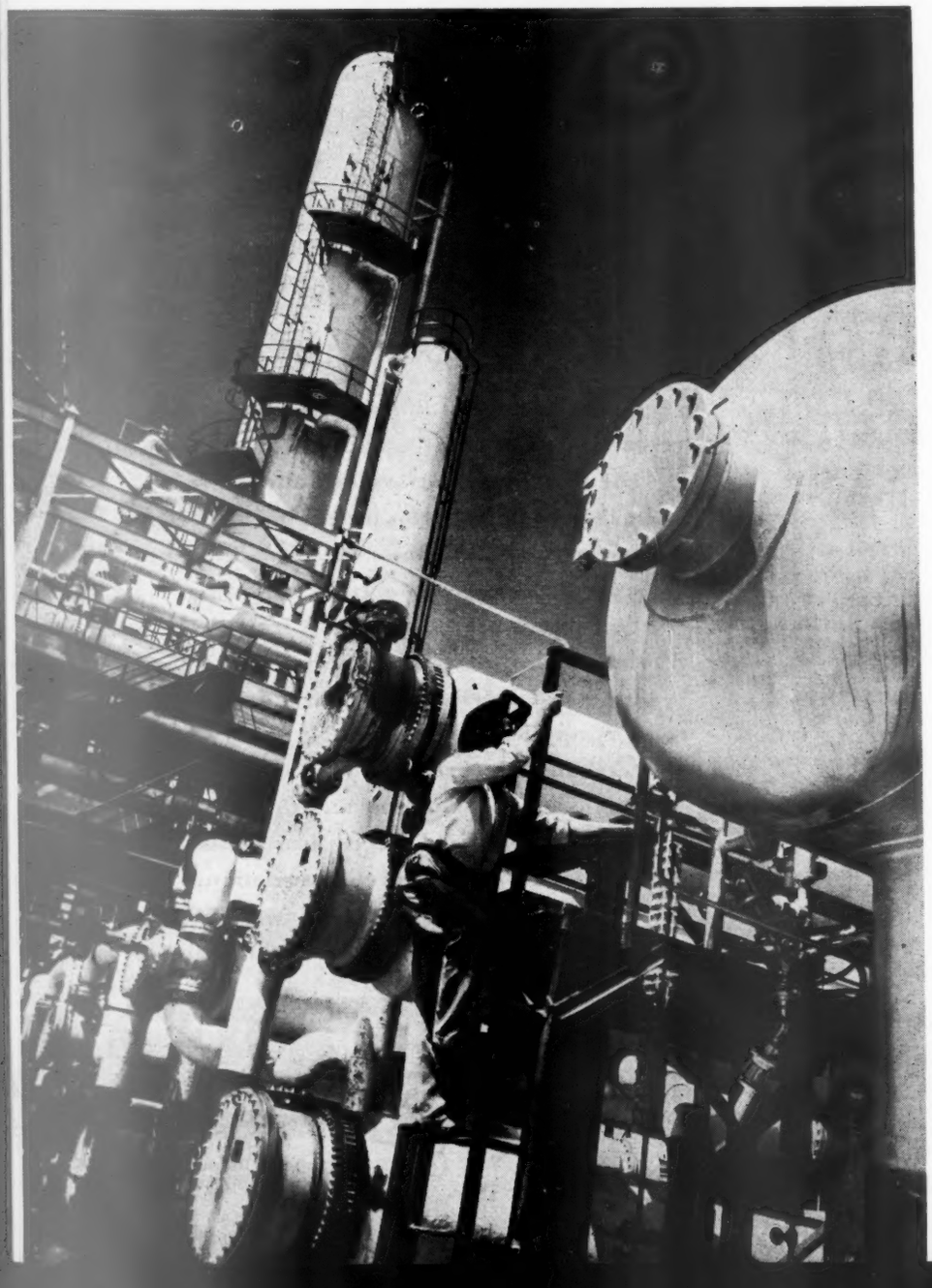
Originally built in 1932, with an 8000-bbl daily capacity, the plant was first bombed in 1940. Allied strategic bombing in 1944 wreaked such havoc, Pinckard reported, "that 100,000-bbl storage tanks were turned upside-down like teacups".

The crude distillation unit is designed for a crude throughput of 14,000 bbl per day, which allows 12,400 bbl of crude on a calender day basis. The atmospheric column separates crude into one whole gasoline cut, one kerosine distillate cut, two gas oil cuts, and residuum. Minimum residuum yield is 35 per cent of crude. The unit has naphtha re-run facilities to separate whole gasoline into a light naphtha cut for sweetening and blending into finished gasoline. Naphtha bottoms are charged to the naphtha reformer unit. A stabilizer debutanizes (or depropanizes, depending on finished gasoline vapor demands) light straight run naphtha.

The thermal reformer with a UOP process can charge 3200 bbl per day of heavy naphtha and has towers for vapor phase clay treatment of reformed naphtha. A reconditioned stabilizer controls vapor pressure of the naphtha reformate. The unit's design permits flexibility in reforming severity to permit variation of the product octane number for a reasonably wide range. Gas produced by the unit goes into the refinery fuel system.

A 3650 bbl per day lead sulfide gasoline treating plant sweetens light naphtha from crude running and gasoline reformate, and there are facilities for inhibiting and ethylizing sweetened gasoline. A 380-bbl capacity batch treating plant sweetens kerosine.

Checking heat exchangers of topping unit, Bordeaux, France



## High Polymer Division

Creation of a new scientific division of the American Chemical Society, which will be known as the Division of High Polymer Chemistry is announced by Dr. Ernest H. Volwiler, president of the Society and head of Abbott Laboratories, North Chicago, Illinois. Professor Carl Shipp Marvel of the University of Illinois, has been elected first chairman of the new division, which held its initial sessions in Chicago September 4 to 6 during the Society's 118th national meeting. Professor Herman F. Mark, director of the Polymer Research Institute at the Polytechnic Institute of Brooklyn, is secretary of the division, which becomes the 20th of the scientific and technical groups organized within the Society.

High polymers are multiple molecular structures such as those making up plastics, fibers, and rubber. Interest in the remarkable properties of these molecular giants has increased greatly in recent years among chemists working in several fields.

## Plan 9 Technical Sessions

As many as nine technical sessions including the first ever devoted to electrical equipment in refineries—will be on the program next spring when the Division of Refining of the American Petroleum Institute holds its 16th midyear meeting in Tulsa, Oklahoma, April 30, May 2 and 3.

Analytical research, corrosion problems, disposal of refinery wastes, training of personnel, and safety are among the subjects that will have sessions devoted to their discussion, according to W. M. Holaday, chairman of the program committee and manager of Socony-Vacuum laboratories, New York.

Motor fuels will undergo thorough discussion with at least two and possibly three sessions. One will take up the processing of stocks from crudes with high sulfur content, and the other high vapor pressure blending stocks.

## Houston Is New Plant Site

Houston, Texas has been selected by Ethyl Corporation as the site for new manufacturing plants to produce over a hundred million pounds of chemicals annually, B. Bynum Turner, general manager of Ethyl's manufacturing department announced. The new plants, Turner said, will be integrated to manufacture all the tetraethyl lead, ethyl chloride, sodium and chlorine used in the processes for producing "Ethyl" antiknock compounds. Construction will begin immediately and will be completed, it is expected, by the end of 1951.

## Heads Illinois Refinery

R. I. (Jake) Jacobi has been named assistant superintendent in charge of operations of Sinclair Refining Company's newly acquired refinery at Hartford, Illinois. Jacobi first joined the Sinclair organization in the summer of 1930 during which time he was employed in the technical department of the Marcus Hook refinery. He is a graduate of Colgate University, and has a MS degree from the University of Oklahoma.

He was appointed head of the technical department of the Houston refinery in 1943, and in 1947 he was made refinery foreman.

## Grease Institute Meeting

The National Lubricating Grease Institute will hold its 18th annual meeting at Edgewater Beach Hotel, Chicago, Illinois, on October 30-31, and November 1. This is expected to be the largest meeting this organization has ever held and will have an extensive program of papers on all phases of the lubricating grease industry, Harry F. Bennets, executive secretary has announced.

## Continental Plans $10 Million Expansion

Plans by Continental Oil Company for an expansion program to cost approximately $10,500,000 that will double the crude oil charging capacity of its Lake Charles, Louisiana, refinery were announced by President L. F. McCollum.

The project, which will increase the plant capacity to 25,000 bbl daily, will include installation of a catalytic cracking unit and additional equipment for the production of high octane gasoline, he said. Announcement of plans for enlargement of the Lake Charles refinery followed action by the Louisiana Department of Commerce and Industry in granting a 10-year tax exemption for the project. President McCollum stated that construction of the plant addition will be directed by Harold G. Osborn, Continental vice president in charge of manufacturing. Contracts are expected to be awarded some time in October, and completion of work is scheduled for the early part of 1952.

## FCC Unit Under Way

Louisville Refining Company has announced plans for the construction of a 3000 bbl per day Fluid catalytic cracking unit, complete with polymerization and other auxiliary equipment. Scheduled completion date for the $2,000,000 project is July 1, 1951. Universal Oil Products will handle the design engineering.

The present 2500-bbl per day UOP thermal cracking unit will remain in operation. Crude throughput of refinery is 6000 bbl per day. Louisville Refining delivers about 70 per cent of its gasoline output to Ohio outlets owned by its parent company, Farm Bureau Co-operative Association, Columbus, Ohio.

## Brazil Gets New Refinery

The new 2500-bbl domestic crude refinery built by Brazil's Conselho Nacional de Petroleo has been put into operation. It is situated at Mataripe near Salvador in Bahia, and is equipped with a combination thermal cracking unit. Site and preparation began in April 1949. Crude charge will be drawn from the several fields that the Conselho has developed in the general area and that are now largely shut in. The refinery's production will serve principally the local market needs.

Foundation work has begun on a new considerably larger plant designed for imported crude. The new unit, a 45,000-bbl one, is to be built at Cubatao near Santos.

## North Dakota May Get First Refinery

Standard Oil Company of North Dakota, an independent company, is discussing plans for building a 2000-bbl refinery near Grand Forks, making the first refinery in that state. All petroleum products used in the state have to be imported from other states.

The company stated that state, county, and city laws are favorable for such an enterprise, as they stress the use of products produced or manufactured in the states.

## Grease Booklet Out

"The Fundamentals of Lubricating Greases and Their Application" are covered graphically and colorfully in a new educational booklet of that title published by Shell Oil Company. The new booklet, which is available free, is the eleventh and latest in Shell's "Panorama of Lubrication" series. It is printed on heavy, glossy paper and contains 40 pages of text, photographs, and drawings, many in color.

The basic theme of the booklet is its explanation of the scientific principles that make greases a separate category of lubricants. Besides describing the make-up and general character of greases, the booklet discusses the jobs greases can do best.


TO REPAIR PIPE LEAKS—
QUICKLY, PERMANENTLY
ANY PRESSURE — ANY TEMPERATURE

SKINNER-SEAL EMERGENCY PIPE CLAMP
for pinhole or corrosion leaks.

SKINNER-SEAL PIPE LINE CLAMP for long splits and bad corrosion leaks.

*In stock—all supply stores*

M. B. SKINNER COMPANY
SOUTH BEND 21, INDIANA, U. S. A.

# —PERSONALS—

▸ **J. S. Worden,** The Texas Company, formerly manager (operations), New York, has been appointed general manager, New York, replacing **G. R. Bryant** who was recently elected vice president at Houston, Texas. **W. B. Logan,** assistant manager (operations), has been made manager (operations); **F. H. Holmes,** general superintendent of the Port Arthur, Texas, Works, replaces Logan in New York as assistant manager (operations); **T. A. Mangelsdorf,** now superintendent of the Lockport, Illinois, Works, becomes general superintendent of Port Arthur Works; **H. S. McCray,** superintendent of Lawrenceville, Illinois, Works, has been made superintendent of Lockport Works; and **H. A. Lord,** formerly assistant general superintendent of the terminal division, New York, will become superintendent of Lawrenceville Works.

Worden was graduated from Princeton University in 1920 with an AB degree. He joined The Texas Company in 1921 as a gager at West Tulsa, Oklahoma, Works, and subsequently held a number of other positions at West Tulsa; Houston, Texas; Lawrenceville, Illinois, and New York. Logan attended the University of Texas, then served in the Artillery during World War I, and returned to the university and was graduated in 1921 with a degree in chemical engineering. He came to The Texas Company in November, 1922, as an engineer at Port Arthur Works.

Holmes was born in Port Arthur, Texas in 1905. Following his graduation from Yale University in 1927, he was employed by The Texas Company as a rigger helper in the producing department. There followed periods of work on pipe line construction and in the Refining Department, and then supervisory positions at a number of Texaco plants, including those at Bordeaux, France.

Mangelsdorf was graduated from the Massachusetts Institute of Technology with a degree in chemical engineering in 1926. He received his Master's degree from M.I.T. in 1929, and in 1930 was appointed to the M.I.T. faculty as assistant professor of fuel engineering. He joined The Texas Company in 1933. McCray was graduated from Pennsylvania State College in 1926 with a degree in civil engineering. The same year he entered the service of The Texas Company as an engineer at Port Arthur Works. Lord joined The Texas Company in 1931. He was graduated from the Rensselaer Polytechnic Institute in 1931 with a degree in chemical engineering. He subsequently held a variety of positions at Lockport Works, Sunburst Works, and in New York, becoming assistant general superintendent of the terminal division at New York in 1948.

▸ **Robert J. Finney,** staff assistant on petroleum refinery operations, has returned to Cities Service Oil Company's staff, after serving with the Interior Department's Oil and Gas Division. He was formerly assistant manager at the company's Petty Island, New Jersey refinery.

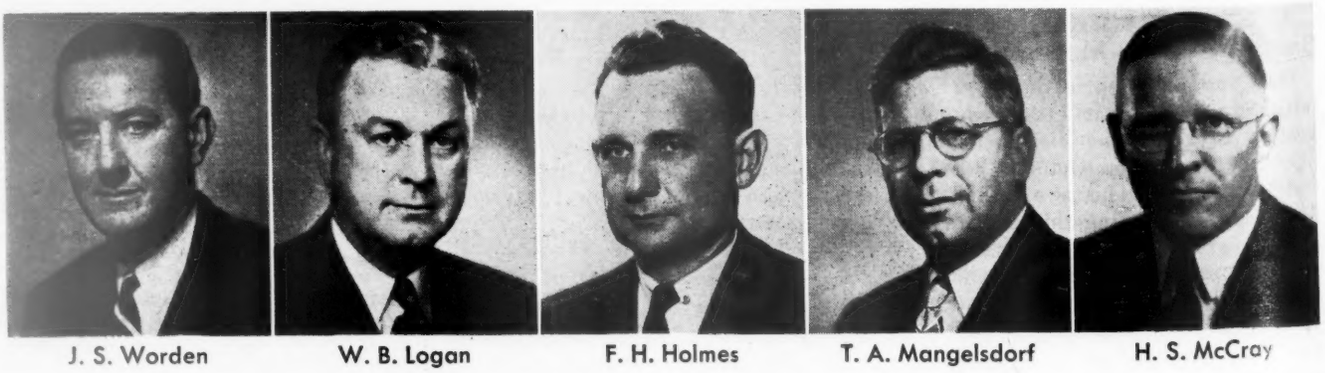
▸ **Irving R. Dunlap, Jr.,** of Glen Rock, Pennsylvania, has been awarded a fellowship in chemical engineering at Illinois Institute of Technology by the Standard Oil Company of Indiana. The fellowship provides an award of $1200 and tuition for two semesters and a summer session. Only stipulation is that the award winner conduct a program of research on a phase of chemical engineering of interest to the petroleum industry. Dunlap received his master's degree in chemical engineering at Illinois Tech in 1949 and was awarded his bachelor's degree in chemical engineering in 1947 at Drexel Institute of Technology.

William T. Cravens

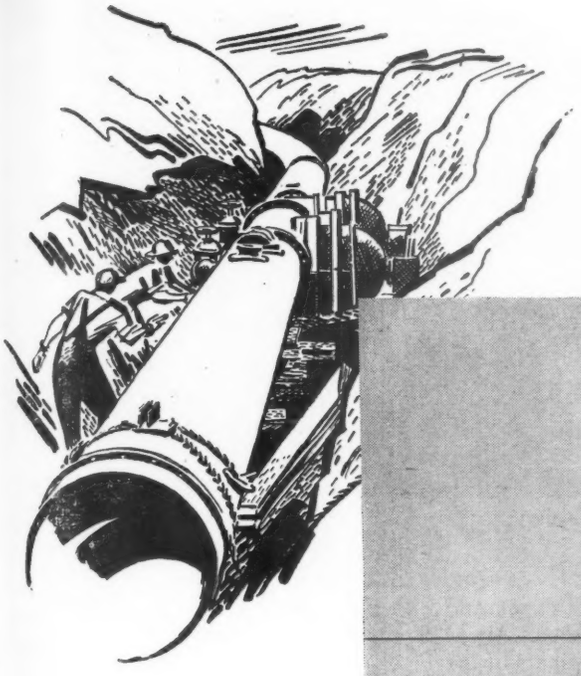
▸ **William T. Cravens,** Cities Service Oil Company (Delaware), Bartlesville, Oklahoma, has been named general superintendent of the company's refinery operations. Assistant general superintendent since June 1949, Cravens was graduated from the University of Arkansas with a degree in chemical engineering. Following his graduation in 1936 he served a year as a government project engineer before joining Cities Service as a junior engineer. In 1939, he was promoted to refinery engineer of their Bossier City plant. From 1942 to 1947 Cravens was employed as chief process engineer of Cities Service Refining Company, Lake Charles, Louisiana.

▸ **Carl E. Baird** has been appointed manager of the Tulsa office of chemical plants division of the Blaw-Knox Company. This office serves the gas, natural gasoline, petroleum, and petrochemical industries with process equipment and complete plants. Originally of Dallas, Texas and with a background of business experience in the Southwest, Mr. Baird has been with Blaw-Knox since 1946.

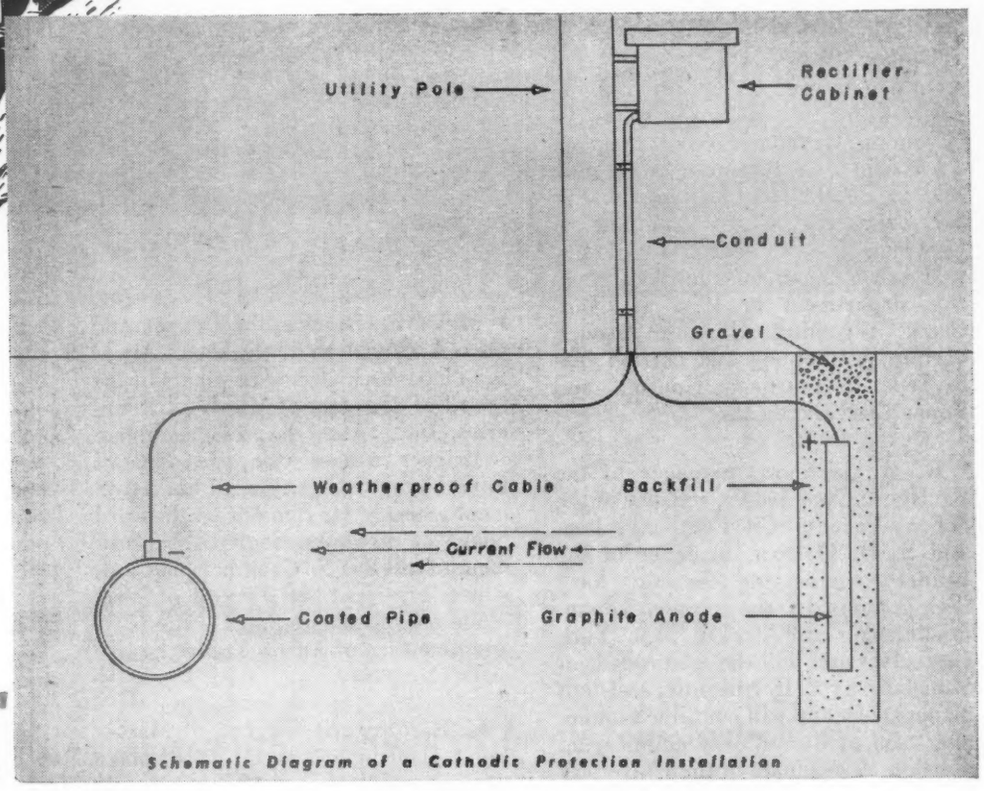
▸ **John A. P. Ohman** has been appointed a senior research engineer in the physics department of Southwest Research Institute. A former vice president of Geovision, Inc., of New York, and chief engineer for the Rieber Research Laboratory of the same city, Ohman includes electronic circuit design, and measurement, recording, and data analysis among his fields of specialization.



J. S. Worden | W. B. Logan | F. H. Holmes | T. A. Mangelsdorf | H. S. McCray



# BURY IT AND LET IT LIE!




Schematic Diagram of a Cathodic Protection Installation

"NATIONAL"
TRADE-MARK

# GROUND ANODES DO THE REST—

"National" ground anodes provide the most practical and economical cathodic protection for buried pipe lines, tank farms, oil well casings, water mains, underground cables, ship hulls, and dozens of other products buried in earth or submerged in water. Here are the reasons:

- **Positive control in any weather; just change a tap on the rectifier to raise or lower current input.**
- **Perfect for use in high-resistance soils.**
- **Longest life of any anode material obtainable.**
- **Thoroughly tested and proved in service for more than 20 years.**
- **Complete and sure protection in sea water—indefinitely.**

***Write to National Carbon Division for catalog section M-8500A, which gives all details on our ground anodes. Address Dept. X.***

**NOW . . . double light at no extra cost!**

Specify the new and improved "Eveready" 1050, flashlight battery and you get more than double the usable brilliant white light for critical uses than is available from any other flashlight battery National Carbon has ever made. The battery is leakproof . . . NO METAL CAN TO LEAK OR CORRODE!

*The terms "National" and "Eveready" are registered trade-marks of*

**NATIONAL CARBON DIVISION**
**UNION CARBIDE AND CARBON CORPORATION**
**30 East 42nd Street, New York 17, N. Y.**
*District Sales Offices:* Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco
**Foreign Department: New York, U. S. A.**

▸ **J. R. Bailey,** former assistant director of natural gasoline and gas operations in Continental Oil Company's production department, has been promoted to director. **C. L. Ritter,** former superintendent, natural gasoline and gas operations, has been promoted to assistant director, succeeding Bailey.

Bailey, who replaces **F. B. Haverfield,** resigned, has been with Continental 23 years. He attended Colorado School of Mines, at Golden, and joined Continental in 1927 in the refinery operated by the company at Glenrock, Wyoming. He later served at the company refinery at Baltimore, Maryland, and in district engineering work in Louisiana. Ritter is a graduate of Colorado State College, Fort Collins, and joined Continental in the production department in 1935 at Lance Creek, Wyoming. He rose through various promotions that carried him to Tepetate, Lousiana, Houston, and Ponca City, Oklahoma.

J. R. Bailey

C. L. Ritter

▸ **R. R. Jackson,** manager of the Paulsboro, New Jersey, refinery of the Socony-Vacuum Oil Company, Inc., and **S. D. Dalton,** manager of the refinery engineering division, have been appointed to the company's manufacturing committee in New York City. Jackson will be succeeded at Paulsboro by **E. L. Sinclair,** assistant manager. Dalton will continue as manager also of the refinery engineering division. A graduate of the University of Texas, Jackson began in 1923 at Beaumont, Texas, in the refinery of the Magnolia Petroleum Company, an affiliate of Socony-Vacuum.

Dalton, who was graduated from Stanford University in 1930 and from the Massachusetts Institute of Technology in 1932, began in 1933 with the General Petroleum Corporation, also an affiliate of Socony-Vacuum, and was transferred to the Socony-Vacuum refinery engineering division in 1940. Sinclair is a graduate of the University of Michigan, beginning with Socony-Vacuum 12 years ago. He became assistant plant manager earlier this year.

▸ **L. W. Alberts,** manager, and **Jack Bardin,** engineer, of the synthetic fuels and chemicals department in Blaw-Knox Company's chemical plants division, are in Europe to study the newest developments in these fields. Blaw-Knox has contracts with the Ruhrchemie and Lurgi companies of Germany and with other European firms for the use of techniques developed in Fischer-Tropsch synthesis, Oxyl synthesis, and other processes of commercial interest to U. S. industries.

▸ **Mead L. Bricker** of Detroit and **Otto A. Seyferth** of Muskegon, Michigan have been elected members of the board of directors of Mid-West Refineries, Inc., Grand Rapids, Michigan.

Bricker was a vice president of Ford Motor Company until his retirement recently. He remains on the Ford board of directors. Seyferth is president of the U. S. Chamber of Commerce, president and director of West Michigan Steel Foundry Company, and president of Austin Trailer Equipment Company.

▸ **L. E. (Spike) Taylor** of Maplewood, Louisiana, was appointed plant manager of the East Chicago, Indiana, refinery of Cities Service Oil Company (Delaware), according to an announcement by Lee N. Haugen, manager of the refining division. Taylor replaced **John D. Snakenberg** who was transferred to the manufacturing department of Cities Service at New York City. Taylor graduated from Texas A. & M. College with a mechanical engineering degree. Following graduation, he was employed by Cities Service as a junior engineer. In 1927, Taylor was appointed resident engineer and assistant superintendent of the Cushing, Oklahoma, refinery. From 1930 to 1943 he was superintendent of pressure stills at the East Chicago, Indiana, refinery.

After graduating from Iowa State College in 1923 with a civil engineering degree, Snakenberg was employed by Cities Service as job order clerk at the Ponca City, Oklahoma, refinery. He was advanced to pressure still foreman of the Gainesville, Texas, refinery in 1925 and to pressure still foreman of the East Chicago refinery in 1930. In 1937, Snakenberg was promoted to superintendent and 10 years later was made plant manager of the East Chicago refinery.

▸ **Frederick E. Frey,** assistant director of research for Phillips Petroleum Company, has been named chairman-elect for the petroleum division of the American Chemical Society. He will serve as chairman-elect until September, 1951, when he will succeed **B. H. Shoemaker** of Standard Oil Company of Indiana, present chairman of the division.

Frey, who is a graduate of Ohio State University and the College of Wooster, Wooster, Ohio, worked at the Bureau of Mines in Pittsburgh, Pennsylvania, for 3 years. He joined Phillips Petroleum Company as a research chemist in 1927.

Frey has been active in the American Chemical Society for many years and has served as chairman of the Oklahoma section. At the present time, he is a councilor from the Northeast Oklahoma section and a member of the Committee on Constitution and By-Laws of the national council. Frey received Southwest Regional award for his outstanding contribution to the chemical profession in 1949.

▸ **R. C. (Rube) Underwood** has been named superintendent and **Aultman T. Smith** assistant superintendent of Sunray Oil Corporation's large catalytic cracking refinery at Sunray (Duncan), Oklahoma. **R. L. (Dick) Johnson** is general manager of the Sunray plant.

Underwood joined Sunray in 1947 as assistant refinery superintendent. He began his refining career with the Rock Island Refining Company in 1927. In 1943 he joined the Associated Refiners Inc., former operators of the now Socony-owned Duncan refinery. Smith began in the oil business with the Cosden Oil Corporation in 1933. In 1943 he also joined the Associated Refiners, Inc. Smith joined Sunray in 1947, as shift superintendent.

Terminal area at Amuay Bay with the pump station in right foreground.

P 615.6

# Operating the ULE-AMUAY Pipe Line

***Constant attention to minute details and to obvious hydraulic factors results in efficiency, safety, and "on schedule" operations.***

H. J. HANLON*

THE Ulé-Amuay pipe line, owned and operated by the Creole Petroleum Corporation in Venezuela, was built in 1947-48 to transport Creole's medium crudes from the Bolivar Coastal area to Creole's new refinery at Amuay Bay, and for export from Amuay to Aruba and other ports. The total length of the line is 143 miles, and consists of two sections, two pumping stations, and a terminal.

The pipe line right-of-way, 60 meters in width of which 30 meters is presently being used, traverses rolling arid country with steep rocky hills between Dabajuro and Amuay, while the portion between Ulé and Dabajuro, or the first half of the line, is semi-arid, semi-jungle country requiring clearing each year. The country generally resembles the southwestern United States. The Paraguaná peninsula where Amuay is located is dry and barren and covered with cactus. Rainfall varies over the pipe line route from 12 in. to 45 in. per year. The climate is good and although there is some hot weather, the trade winds out of the northeast temper it and make generally pleasant weather. The air temperature over an average year will show a minimum of 60 F and a maximum of 95 F.

The pipe line crosses 12 rivers ranging in width from 50 ft to 250 ft. Normally the rivers are dry, but during the heavy rains that fall in the mountains a few miles east of the line, the rivers rise to raging torrents at times carrying logs and boulders along their watercourses. There are generally two rainy seasons each about three months in duration. The two rainy seasons usually occur from the middle of April to the middle of July, and during September, October, and November.

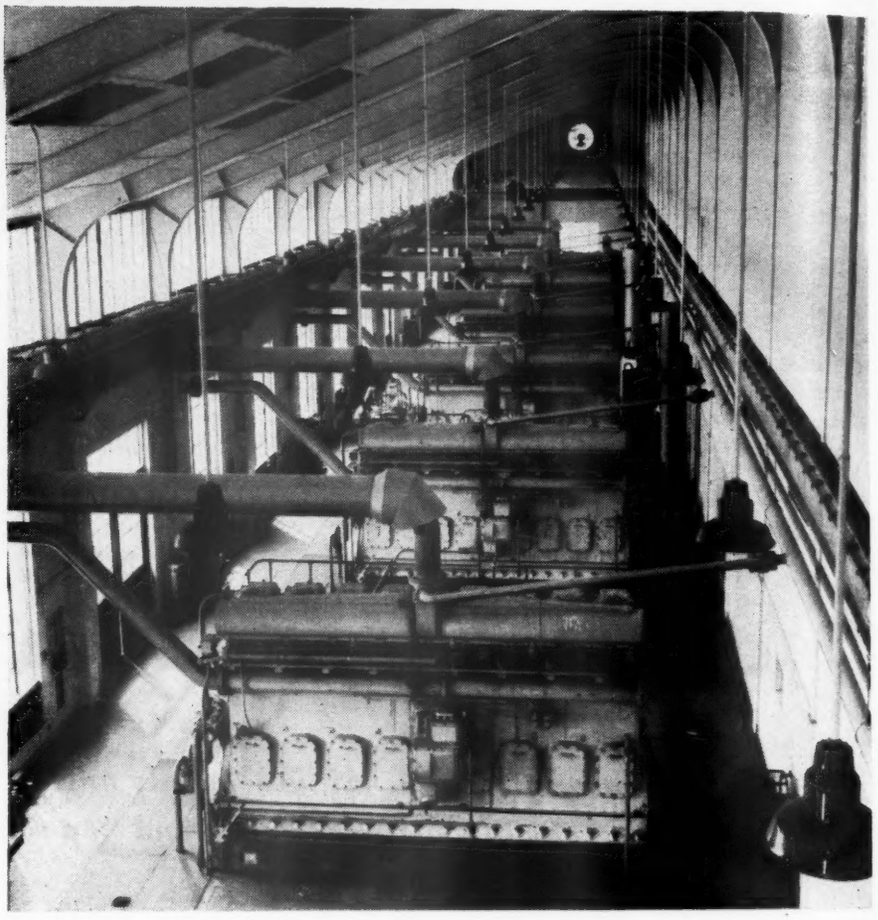
There are almost no roads available along the pipe line right-of-way that could be used for line maintenance and repair execpt the old stringing road built during construction. During the rainy season practically all land transportation stops or is materially reduced between Ulé and Dabajuro. In the dry season the line can be inspected by jeep or power wagon from Ulé to the coast (118 miles) in about 10 hr, including a 1 hr delay for inspection. In wet weather a considerable part of the right-of-way becomes impassable except by burro. Beyond Dabajuro a small swamp and rising rivers block all travel for days at a time. Each year due to washouts and erosion pipe line crews are required to work over the old stringing road. Bridges over

*Division Pipe Line Supervisor, Creole Petroleum Corporation.

EXCLUSIVE

PHOTOS COURTESY
CREOLE PETROLEUM CORPORATION

Pump station at Ulé.



Gas-diesel engines at Ulé.

waterways are practically non-existent.

The pipe line lies on top of the ground except out of Ulé for 2 kilometers, and in and out of Dabajuro for 2 kilometers each way, and at road crossings. The line was laid below the surface of the Gulf of Coro, a distance of approximately 15 miles. The line lies on the gulf bed and has buried itself very little since it was laid in November, 1948. Under water, and where the line is buried, it is coated and wrapped. The line rests on wooden skids for approximately 3 kilometers near the coast over corrosive salty sand flats. Little of the rest of the land section of the line rests on skids. Very little corrosion of the pipe in contact with the ground is found; however, constant inspections are made for corrosion hot spots developing where ultimately the line may have to be put on skids.

Section 1, from Ulé to Dabajuro, consists of 11 miles of 24-in. OD, 110-lb pipe, and 55 miles of 26-in. OD, 103-lb pipe. Section 2, from Dabajuro to Amuay terminal, consists of 15 miles of 24-in. OD, 110-lb pipe, 47 miles of 26-in. OD, 103-lb pipe, and 15 miles of 26-in. OD, 136-lb pipe in the Gulf of Coro. The 24-in. OD pipe is on the high pressure side of each station. All pipe is Grade B seamless. A working pressure of 700 psi is maximum for the 26-in. pipe and 875 psi for the 24-in. Scraper traps were installed at each station and at the terminal, as well as at the junction of the 24-in. and 26-in. pipe in each station. The scraper traps in the two sections are enclosed with high chain link fence.

At river crossings steel pipe bents of 8-in. and 16-in. pipe piling were driven and the line laid on top of the bents over the rivers. The bents are on 40-ft centers.

The line capacity of the Ulé-Amuay pipe line is 300,000 bbl per day at 875 psi the operating pressure. At the present time two segregated crudes are handled; one crude is Tia Juana medium 27.5 API and the other Tia Juana 102 low pour 26.0 API. The viscosities of these two crudes range from 100 SSU to 150 SSU at operating temperatures. The low pour is a premium grade crude and will not meet market specifications with more than 0.25 per cent contamination of other crudes. This crude's pour point is minus 30 to minus 35 F. A recent test made of the fluid flow through the 24-in. and 26-in. pipe in actual operation over a wide range of volumes indicates that the friction factor "f" falls very close to the Stanton and Pannell curve for both sizes.

### Pumping Stations

There are two pumping stations on the line, one at Ulé, the initial station, and the other at Dabajuro, 66 miles northeast of Ulé. Ulé station has an elevation of 15 ft, Dabajuro 300 ft, and Amuay terminal 100 ft, all above sea level. The line rises to a maximum elevation of 460 ft 27 miles east of Dabajuro.

Ulé station is situated on the east shore of Lake Maracaibo about 50 kilometers southeast of Maracaibo, and is almost in the center of one of the largest medium crude oil producing areas in the world. At this station there are seven 50,000-bbl-per-day pumping units each consisting of a 1000-hp 15½-in. by 22-in. gas-diesel engine directly connected through a firewall to an 8-in. by 24-in. horizontal triplex plunger pump. Normal operating speeds are 300 rpm for the engines and 48 rpm for the pumps. The pumping engines have automatic controls and will shut down on high water temperature, low lube oil pressure, and overspeed. All engines are equipped to maintain a constant discharge pressure (875 psi) from the pumps by automatically regulating the engine speed from 225 to 325 rpm. Normal operations are between 295 rpm and 315 rpm. Cooling of the engines is by

circulation in a closed system through fin-fan coolers. Recording temperature control pilot and diaphragm control valve regulates the amount of water pumped to the jacket water cooler or bypassing the jacket water cooler to maintain constant jacket water inlet temperature of 155 F (adjustable) to all engines. HD 40 type lube oil is used in the engines and is circulated through coolers and filters. Pump lubrication is by forced feed system with a standby gravity tank to be used in case of power failure. SAE 40 lube oil is used for general pump lubrication with type 250 W used in the gear case and floating shaft couplings.

Two of the engines at this station are operating on about 10 per cent fuel oil and 90 per cent natural gas mixture. The others will be converted to this type fuel in the near future. Electric power is furnished by Creole's Punta Gorda power plant 5 miles distant, but a 580-hp 13-in. by 16-in. engine connected to a 350-kw generator was installed at Ulé as a standby. All auxiliary equipment such as suction pump, sump pump, fuel oil centrifuges, fin-fans, jacket water pumps, booster pumps, etc., are motor driven.

The working tanks at Ulé station consist of eight 150,000-bbl floating roof tanks. Five of these are in Tia Juana medium service and the other three in Tia Juana 102 low pour service. The crude oil is received in these tanks directly from flow stations situated on platforms out in Lake Maracaibo. (All Creole production in this area is produced from locations out in the Lake.) The crude from tankage flows through two 24-in. OD suction lines to two 150,000 bbl per day 60-ft head vertical in-line suction pumps. Pump suction inlet pressures will vary from 14 to 33 psi, depending on tank head.

All crude received by the pipe line at Ulé is fiscalized or measured by the station gaugers and witnessed by government inspectors. Fiscalization (a royalty determination process) is done at 5 a.m. each morning in tanks receiving the field stream.

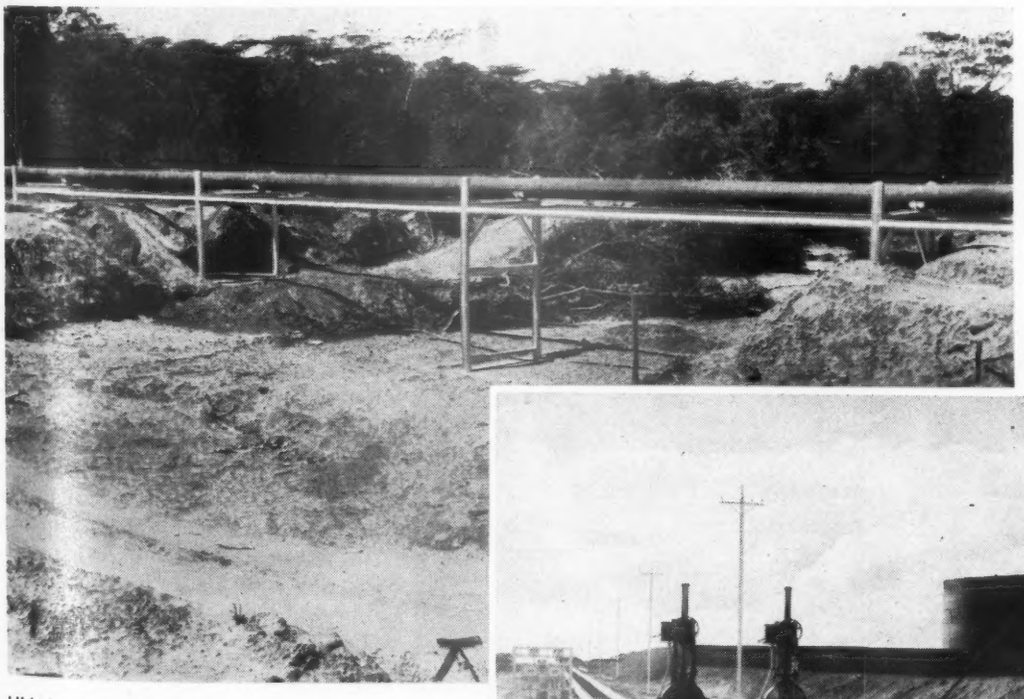
Dabajuro station, or the second station midway on the line, is essentially the same as Ulé station except Dabajuro has two electric power generating units similar to Ulé's, one of which provides all the power for the station area while the other is standby. These units are run alternately every 30 days. Fuel for the engines is crude from the line, as there is no natural gas available here for dual fuel operation. Fuel for the engines here and at Ulé is centrifuged at operating temperatures. Dabajuro has three 96,000-bbl cone roof working tanks. One is used in over and short service for Tia Juana medium; one for such service for Tia Juana 102 low pour, and the other is tied into the trunk line pressure relief station situated a few hundred yards on the upstream side of the station manifold. Crude from tankage flows through two 26-in. OD suction lines to the station. There are no booster pumps at this station. Suction pressure is obtained from tank elevation. Such pressure at pump suction varies from 6 to 12 psi, depending on tank head.

### Amuay Terminal

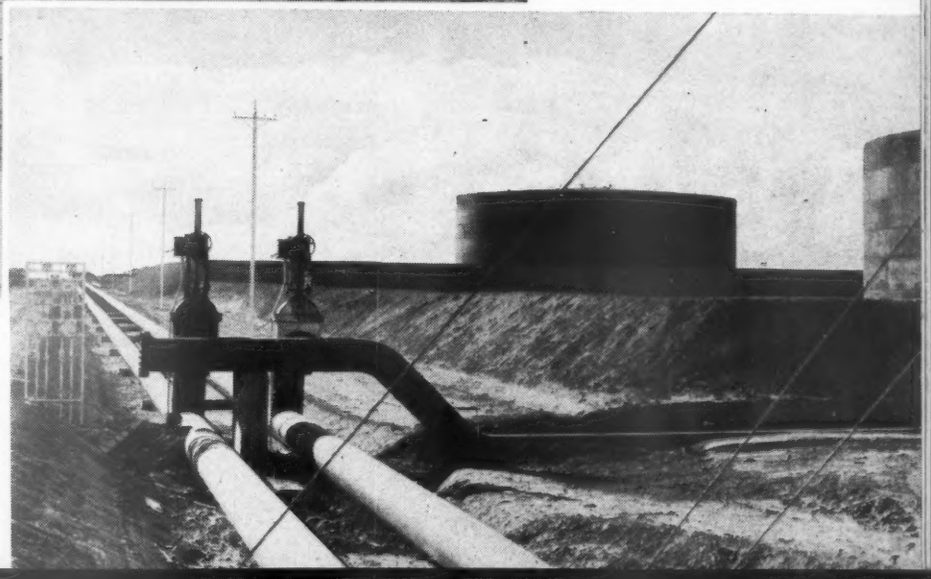
Amuay terminal, the pipe line terminus, receives crude in 8 cone roof and 8 floating roof 150,000-bbl tanks where the crude is accumulated for shipment by tanker to Aruba and other ports. At present the pipe line uses 3 cone roof tanks for low pour crude and 8 floating roof tanks for medium crude. The Creole Amuay refinery receives crude from the pipe line in three 150,000-bbl floating roof tanks and two 96,000-bbl floating roof tanks. A pressure relief station for the trunk line ties into one of the cone roof tanks.

All large suction line valves on the system are motor operated, requiring about 3 minutes to open or close. To open such size valves by hand would require an hour with two men to open or close one valve.

The first crude oil was pumped from Ulé station on December 14, 1948, arriving at Amuay terminal December 17, 1948. Dabajuro began pumping crude May 19, 1949. Scrapers have been run through the line several times and each time a very limited amount of sediment was removed, the scrapers



Ulé-Amuay pipe line where it crosses Agua Viva River near Dabajuro.



Fill and discharge lines to tanks at Amuay, with motor-operated valves.

showing very little damage in their 55 to 62 mile travel. The crudes transported are asphaltic base and average less than 0.5 of 1 per cent basic sediment and water. There are no paraffin troubles.

As the pipe line is laid on top of the ground, oil temperatures vary widely over a 24-hr period. These oil temperatures run from a minimum of 80 F to a maximum of 115 F. Between the hours of 12 noon and 8 p.m. Amuay terminal receives approximately 500 bbl per hr more crude than Dabajuro pumps. After 8 p.m. Dabajuro averages pumping 250 bbl per hr more than Amuay receives. It balances out in the 24 hr. The oil temperatures for a month will average outgoing at Ulé 88 F; Dabajuro incoming 94 F, outgoing 98 F, and incoming into the Amuay terminal 89 F.

### Communications

Communication is by wide band FM multiplex modulated radio with two teletype circuits and one voice circuit operating simultaneously. The radio carriers operate in the 75 megacycle band (72-76) four frequencies, 72.1, 72.3, 75.7, and 75.9. Two hundred and fifty watt stations were installed at La Salina (10 miles north of Ulé station), Dabajuro station, and Amuay terminal. There are four operating transmitters and four standbys. At La Salina one 350 ft tower was erected for receiving and transmitting. At Dabajuro two 350 ft towers were erected, one receiving and one transmitting. Dabajuro repeats both ways. At Amuay 100 ft towers were erected.

### Operating Problems

The problems encountered in operating the Ulé-Amuay Pipe Line System are many and varied. The laws of Venezuela require that, companywide, at least 75 per cent of the employees must be Venezuelan Nationals. Generally speaking, all orders and instructions must be in Spanish. The expatriate (North American) pipe line operators brought in by Creole have the responsibility of not only operating the system, but of teaching and training the national personnel how to operate a pipe line. To do this properly requires a working knowledge of the Spanish languge. Most of the Ulé-Amuay pipe line expatriates attended the Creole Spanish Induction School. After school, depending on the man, it requires about two years service with nationals to have a good working knowledge of Spanish.

The Ulé-Amuay pipe line organization follows United States practices generally, except where company policies indicate otherwise. In the organization, but known by different titles, are the pipe line superintendent, chief dispatcher, master mechanic, electrical foreman, line maintenance foreman, chief engineers, engineers, oilers, gaugers, accountants, and others. Pipe line general headquarters are in Tia Juana, two miles south of Ulé Station.

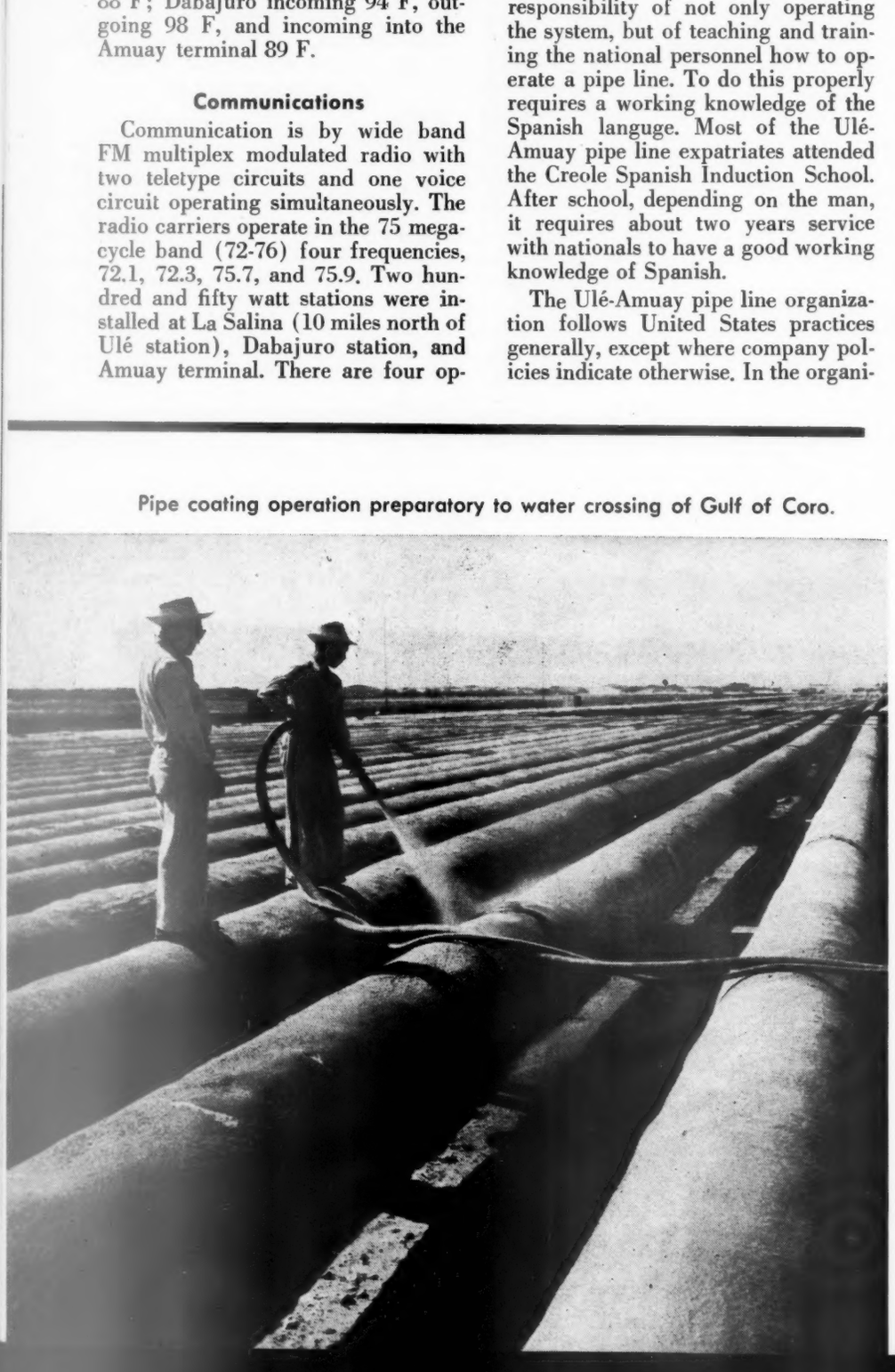
The pipe line being new to Creole's operations there were a limited number of national personnel trained in pipe line operations and available for employment on the new pipe line. The Venezuelans are eager and anxious to learn their jobs, however, and in the years to come will make very acceptable pipeliners. At the present time there are approximately 25 expatriates and 140 nationals in the Ulé-Amuay Pipe Line organization.

In general, the personnel is housed in production department field camps where modern housing conditions are available. Workers are transported to and from work in busses. Company operated commissaries provide a wide selection of foodstuffs. Privately owned stores are available to supply food, clothing, and other items. Company operated dispensaries are available for the employees, and well run and staffed hospitals are in the area. Schooling for expatriate children is limited to grammar school. The company pays the transportation to and from the United States of expatriate employees' children after grammar school until they are 18 years of age.

Dabajuro station being isolated as it is receives supplies and materials by truck, (materially slowed down in the rainy season) and by airplane. One commercial line has service into Dabajuro once each day each way. The Creole plane provides company service into Dabajuro about twice each week. Ulé station and Amuay terminal have no supply line difficulties.

The personnel operating the pumping station is about as follows: The normal first shift at each station is manned by one expatriate operator, one expatriate mechanic (subject to 24-hr call) one national foreman, two national oilers, two national gaugers with assistants (Dabajuro requires less gaugers and assistants than Ulé), the yard gang, and one clerk. On each of the other shifts appear one expatriate operator, one national foreman, two national oilers, and two national gaugers with assistants. Each shift is 8 hr and the work week is 48 hr. One chief engineer at each station supervises all operations. The Amuay terminal operates each shift with national gaugers and assistants, with one expatriate supervising all shifts, usually working the first shift and subject to call on the others.

Pipe coating operation preparatory to water crossing of Gulf of Coro.



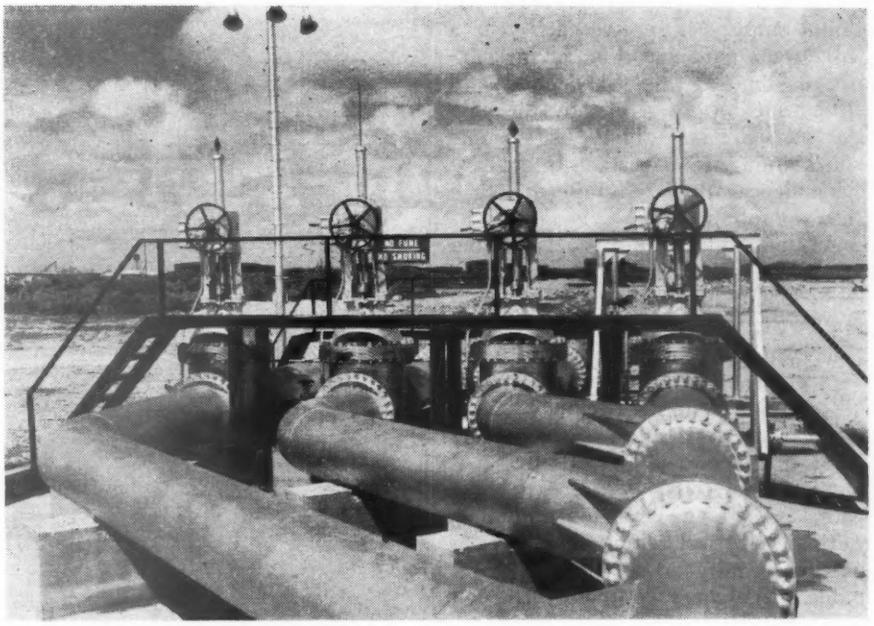
The maintenance and overhaul of the 15,740 installed engine horsepower and the fourteen 50,000 bbl per day main line pumps is in charge of the master mechanic. His force consists of three expatriate diesel mechanics and six national helpers. The production department maintains a large, modern machine shop at La Salina where the pipe line needs along that line are met. At Dabajuro a small shop for minor local needs is maintained by the pipe line. The considerable delay in the time consumed between requisitions and the receipt of material and replacement parts causes considerable anxiety on the part of the maintenance crews in keeping the equipment operating. It usually requires from six months to a year or more to get much needed supplies.

All electrical equipment including cathodic units are maintained by one expatriate electrical foreman with national laborers. Cathodic units are installed and in operation at Ulé and are presently being installed at Dabajuro and soon at the Gulf of Coro water crossing. These units are for corrosion control of the main line buried or under water at those points.

The main line crew consists of one expatriate general foreman with one national foreman and 10 laborers, two power wagons, and the appropriate pipe line tools. Clearing the right-of-way, removing drift from pipe line support bents at rivers, rebuilding eroded points along the line, keeping skids under the line at critical points, are among the chief duties of this crew. This crew also does any necessary pipe line maintenance work at the stations in conjunction with the stations' yard gangs.

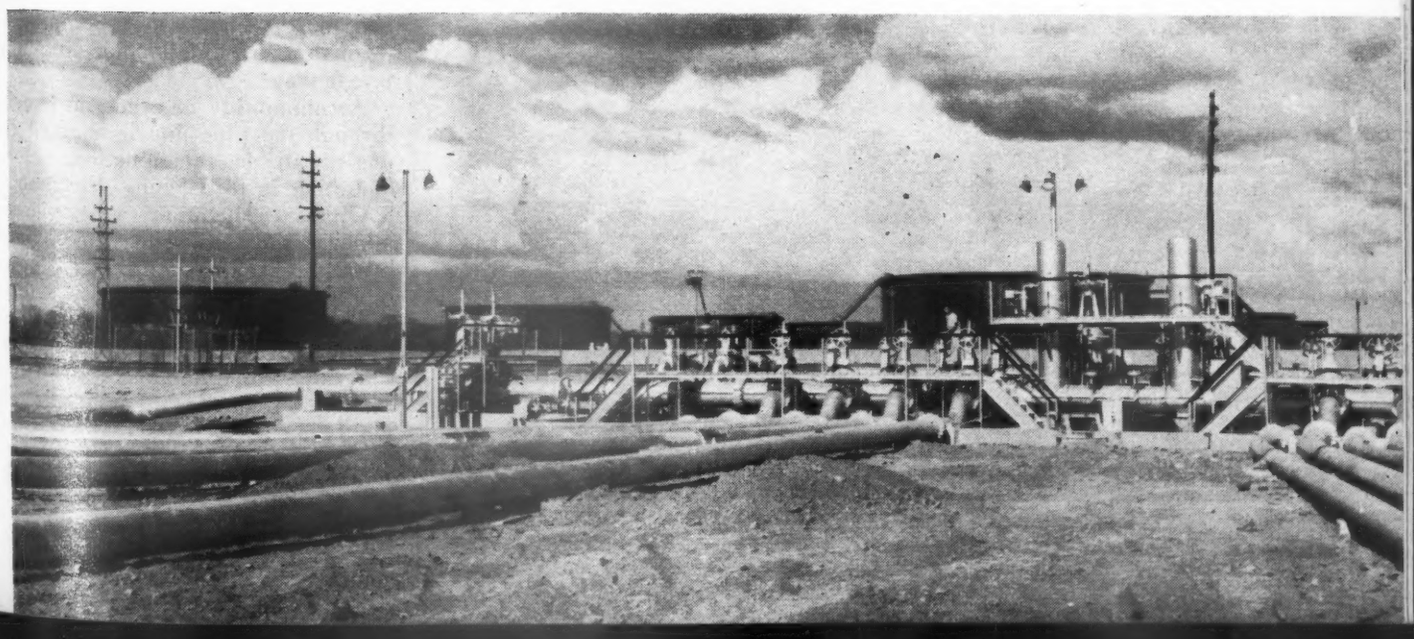
The pipe line is patrolled by a single engine plane on charter from a local company. Patrolling is done about twice each month during the dry season and usually once a week during the rainy season. Observations are made at about 800-ft elevation. The line mileage is marked in the pipe every 5 kilometers in large orange colored figures easily read by the plane's observer, who is the general foreman. Driftwood against the pipe bents is the most worrisome hazard to line safety and this is reported by plane observation along with other data required in the operation of the line. The plane does not carry a radio but contact with ground crews when necessary is only a matter of minutes. Land inspections are frequently made by the general foreman, who has a power wagon equipped with receiving and transmitting radio equipment to enable him to talk to the pump stations or the pipe line headquarters.

Vacation relief schedules have to be planned to maintain the minimum number of personnel required to man the system properly and maintain throughput. Every two years expatriate employees receive a vacation to return to their point of origin. Time off is paid by the company to the employee and round trip transportation for him and his family. The time off usually amounts to 50 days from the time the employee leaves until he reports back on the job. On alternate years he receives a two-week paid vacation excluding transportation. Na-



Scraper trap manifold at Amuay.

Pump station manifold at Ulé.



tional employees receive each year a three-week paid vacation. Living conditions on the whole are good and little time has been lost by the men due to sickness. While this is some consolation, we nevertheless have to schedule vacations carefully and take sickness into account.

As the production of the Tia Juana area is well over the Ulé-Amuay pipe line capacity, the problem of dispatching is relatively simple. This advantage has been utilized by planning a very precise and carefully timed cycle of pumping. The dispatching department is supervised by an expatriate chief dispatcher. Four national dispatchers run tour, one on each shift with a swing man. These four nationals were and are still being trained by expatriates, and have developed into capable dispatchers in the short time (18 months) they have been working.

The technique of dispatching and other allied practices were set out as clearly as possible in a "Manual of Operations" compiled by the present Ulé-Amuay supervisor and the chief dispatcher. This manual was made available to all operating personnel and is written in both English and Spanish. Charts, maps, diagrams, and tables were used to illustrate important details of operations.

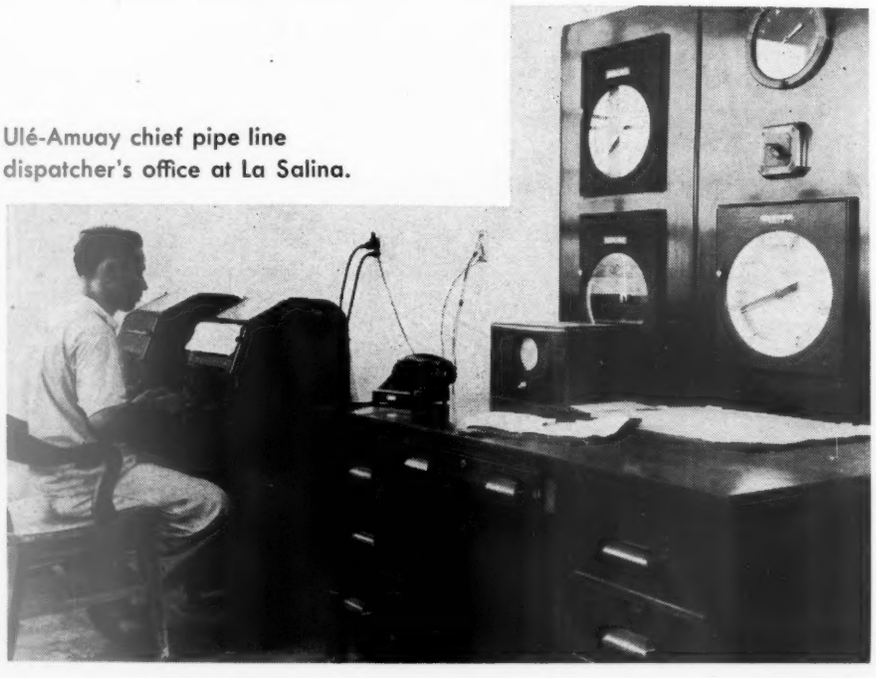
The physical facilities of the pipe line set the optimum batch size of low pour 102 at 360,000 bbl in 7-day cycles. Tia Juana medium batches average 1,740,000 bbl, varying with low pour production rate. The 7-day cycle permits full usage of tankage. Tanks are worked in the same sequence each cycle.

The shift dispatcher records hourly all important data from stations and the terminal. Routine operating orders are given in advance to insure the understanding and cooperation of station personnel. There are no dispatchers at the stations or terminal. The station crews receive dispatching orders from and report pertinent data to the dispatchers in Tia Juana. Batch changes and forecasts are figured from hourly tank gauges of receipts and deliveries. Careful segregation of crudes is accomplished by using products pipe line practices. Graphic and tubular data are used to verify all forecasts. Stations and terminal being equipped with radio-teletype units, information on any situation is immediately available to all points simultaneously. Gravitometers installed at each station and terminal aids dispatching very materially in making batch changes. Records reveal that loss of premium crude Tia Juana 102 low pour by contamination can be held to less than 1 per cent of the 360,000-bbl batches (including both ends of the batches) in pumping it through the 143-mile pipe line and into tankage.

Accountability of crude movement through the pipe line is handled by one expatriate and a national clerk operating in dispatching department.

Constant attention to apparent minor details, as well as to obvious hydraulic factors recurrent in pipelining, has resulted in efficiency, safety, and "on schedule" operations. Due to Creole's basic policy of operating, the Ulé-Amuay pipe line operations from Ulé to the Gulf of Coro are under the Tia Juana district, whereas the Gulf of Coro section and the Amuay terminal fall to the refinery group. * *

Incoming header gate and pressure relief station, Amuay.



Ulé-Amuay chief pipe line dispatcher's office at La Salina.

# *Canada's* GIANT NEW PIPE LINE...

▲ Koppers Bitumastic Enamel being machine-applied.

▼ When completed, this giant line of the Interprovincial Pipe Line Company will carry oil from Edmonton, Alberta, to Winnipeg, Regina and tankers on the Great Lakes. It will require 64,330,000 gallons of oil to fill this line.

## protected by KOPPERS BITUMASTIC ENAMEL

● From one end to the other, the new 1,150-mile line of the Interprovincial Pipe Line Company will be protected against corrosion by Koppers Bitumastic® 70-B Free-Flowing Enamel. This giant outlet will carry the production of Alberta's oil fields to Winnipeg, Regina and Ontario markets.

Koppers Bitumastic 70-B Enamel, machine-applied over a coat of Koppers Bitumastic 70-B Priming Solution, will protect 450 miles of 20″ pipe, 340 miles of 16″ pipe, and 360 miles of 18″ pipe. Highly-corrosive soils, river crossings, cold weather—all types of rugged conditions—will test the effectiveness of the protective coating.

Many of America's pioneer oil and gas pipe lines—laid in the twenties—are still giving good service today, thanks to the effective protection of Koppers Bitumastic Enamels. And hundreds of applications of Koppers Bitumastic Enamels have given Koppers engineers unequalled experience in pipe-line protection—experience that can help you.

Give your pipe lines *assured* protection against corrosion by specifying "Koppers Bitumastic Enamel." Get in touch with your Koppers representative for complete details and estimates.

**Why Bitumastic Enamels give lasting protection**

*Processed from a base of coal-tar pitch, they are impervious to moisture . . . chemically resistant to soil elements. They make a tight bond with the pipe . . . do not disintegrate with age . . . maintain continuously high electrical resistance.*

KOPPERS BITUMASTIC ENAMELS
REG. U.S. PAT. OFF.

**KOPPERS COMPANY, INC., Tar Products Division, Dept. 1051T, Pittsburgh 19, Pa.**

Heath-King Studios photo, Edmonton

Aerial view of Edmonton pumping station shows six storage tanks (140,000 bbl each) nearing completion and construction under way on the main building at the left. Right foreground shows pipe and equipment on the pipe line right-of-way where it enters the station site and crosses a main highway leading into Edmonton.

P 615.3

# The Story of Interprovincial

*Discovery of important reserves in western Canada necessitated pipe line to transport crude to eastern and prairie refineries.*

FRANK H. LOVE*

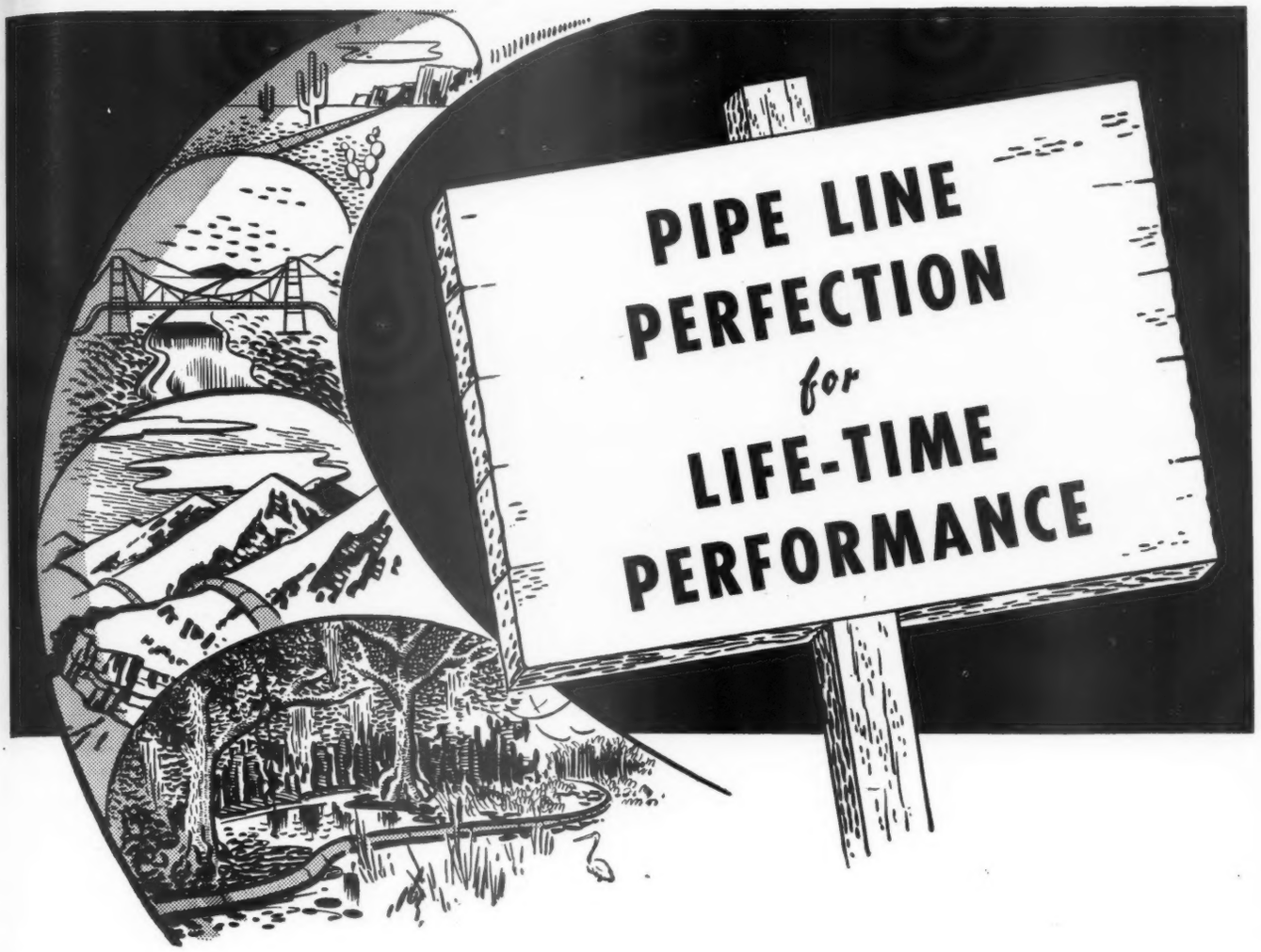
THE story of the Interprovincial Pipe Line Company and its American affiliate, the Lakehead Pipe Line Company, begins with the discovery of the Leduc field in February of 1947. It is true that as early as 1938 the advantages of a pipe line outlet for western Canadian oil was thought of, but until Leduc was discovered reserves were not great enough to make economically feasible the considerable monetary expenditure required. By the time Leduc was firmly established as a major oil field, plans for a line from Edmonton had crystallized, although its exact route and terminus had not been determined. Subsequent changes in the producing picture, particularly the major discovery at Redwater, entered importantly into the final plans.

As originally projected, the line was to transport crude oil from the Edmonton area to refineries at Regina. Demands east of that point were to be supplied by rail. With this plan in mind a design engineering office was established. One of the first tasks was to make an aerial survey of the proposed route. With the stereos and mosaic prints thus provided, major obstacles, such as farm buildings and other permanent structures, were located and from the mosaics plats or maps were made of the route. These gave information for a detailed ground survey. This survey was made during 1949 and completed plans presented to the Board of Transport for approval.

In the meantime other engineering problems were being solved. Among them were the determination of throughputs, what affect varying temperatures would have on viscosity of the crude, what the pressure drop would be per mile in various diameter pipe, etc. As a result of such studies, it was decided that 16-in. pipe of two wall thicknesses, 5/16 in. and 9/32 in., should be used. This, be it remembered, was on the basis that the

*EXCLUSIVE*

*Oil and Gas Pipelining Editor.




PIPE LINE ENGINEERS CONTRACTORS
Williams Brothers Corp.

**Through the toughest terrain and climatic conditions Williams Brothers Corp. has built pipe lines—through mountains and forests — swamps and deserts — on three continents—the past 36 years. Experienced engineers and mechanics, skilled construction crews and modern machinery enable Williams Brothers to plan and engineer pipe line construction over the shortest, safest and *most direct route* from producing fields to refineries, export terminals and consumer markets.**

# WILLIAMS BROTHERS CORP.

ENGINEERS — CONTRACTORS

Oil • Gas • Gasoline • Water

Pipe Lines and Pump Stations

**NEW YORK • TULSA • ATLANTA • HOUSTON**

*Heath-King Studios photo, Edmonton*

Sideboom tractor deep in a small slough near Sedgewick, Alberta, during coating and wrapping operations.

line would terminate at Regina. Then came development of Redwater into a major oil field. Now reserves were sufficient to supply eastern Canadian refineries also. This need was recognized from the beginning but the crude oil was not available.

In view of the added factors entering into the picture it became necessary for those in charge of planning the system to make a fresh start. The result was a decision to extend the line on to Superior, Wisconsin, and move the crude from that point into eastern Canada by lake tankers. Selection of Superior as the terminus of the pipe line instead of a Canadian port on Lake Superior was influenced by economic factors. A port already existed at Superior and to construct one in Canada would have required the expenditure of $10,000,000 additional and increased the cost of moving the oil by 10 cents a barrel.

Another result was the decision to increase the size of the pipe between Edmonton and Regina from 16 to 20 in. The engineering group had established the fact that by using a safety factor of 1.5 and wall thickness tolerance of minus 12½ per cent for 42,000 psi and 46,000 psi yield steel, the 16-in. line would have a maximum throughput of 125,000 bbl a day at an operating pressure of 1050 psi with 8 pumping stations. By increasing the diameter of the pipe to 20 in., throughput would be increased to 145,000 bbl a day at the same operating pressure and only 4 pumping stations would be required. So it was decided to use 20-in. pipe between Edmonton and Regina. Under the initial plan, however, a contract already had been awarded for fabrication of 16-in. pipe, and considerable trouble having been experienced in finding pipe in the first place, this 16-in. would have to be used somewhere in the system. As there would be a sizable take-off at Regina, decreasing the throughput east of that point, it was found feasible to use the 16-in. on the section between Regina and Gretna.

For the American section of the line, between the International Boundary south of Gretna and Superior, which is being constructed and will be operated under the name Lakehead Pipe Line Company, 18-in. diam pipe was selected. The engineering study showed that by using 18-in. pipe with a thinner wall (9/32 in.) and operating at a maximum pressure of 837 psi, throughput capacity would not be impaired and a considerable savings would result in initial investment and operating costs.

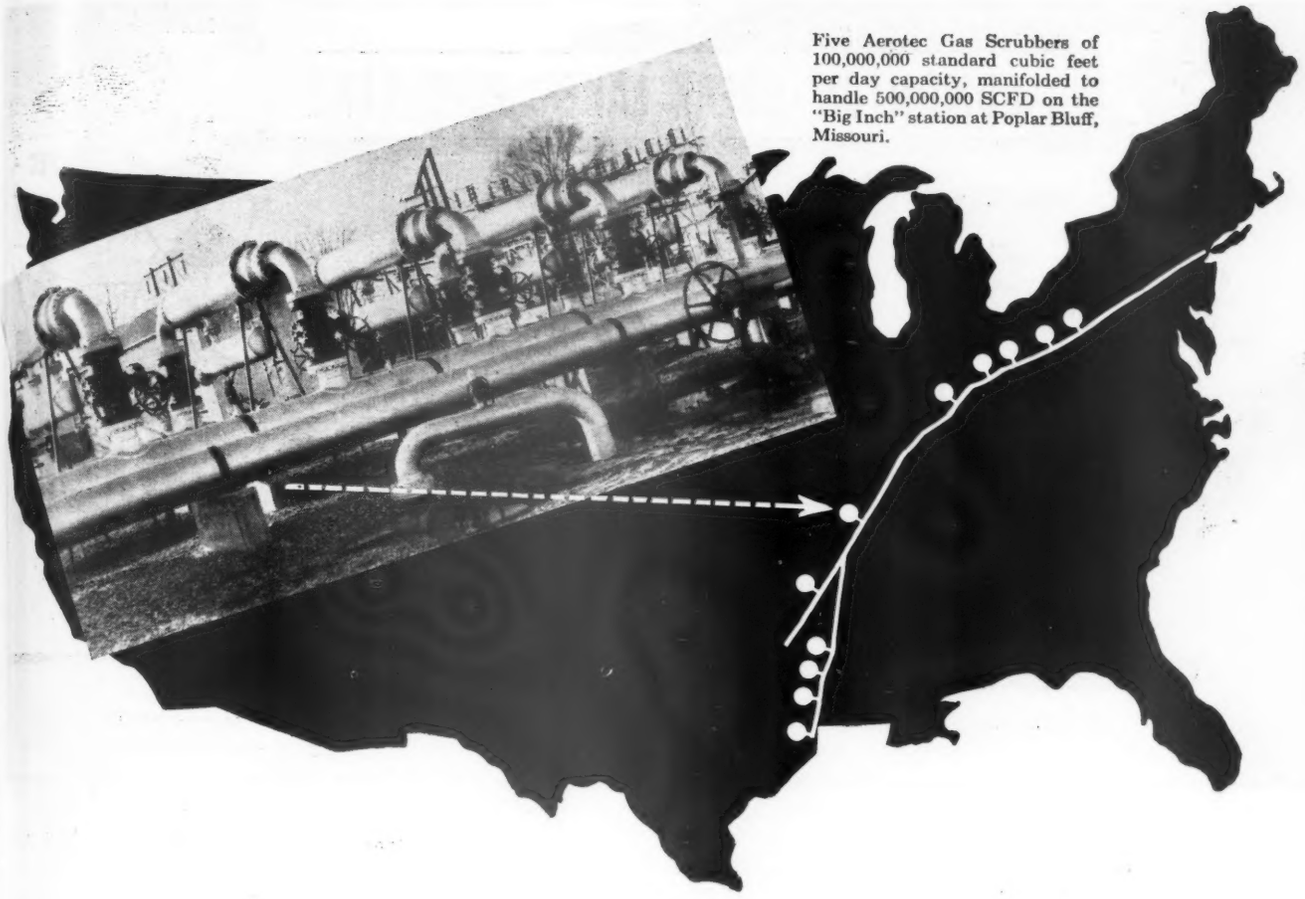
Thus, the final decision was to build the Edmonton-Regina section of 20-in. pipe, with an intermediate pumping station at Kerrobert, Saskatchewan. From Regina to Gretna the pipe size is 16-in. diam with an intermediate station at Cromer. The section from Gretna to Superior is being constructed of 18-in. pipe with an intermediate station at Clearbrook, Minnesota. These three intermediate stations, plus three main stations at Edmonton, Regina, and Gretna will give a total of 6, which will move 90,000 bbl a day be-

### Progress Report

By September 1 approximately 900 miles of ditch had been completed and welding, coating, and wrapping operations were following closely behind.

The six 140,000-bbl tanks at Edmonton pump station were about complete and work was progressing on the 6 pumping stations along the system. Work also was under way on all 12 of the storage tanks at Superior, Wisconsin and the loading dock there.

First oil to enter the system was turned in to the 30-mile Redwater to Edmonton section of line on August 25, to begin filling the storage at Edmonton. It is planned to have storage filled by late October and to have crude ready to enter the line to Regina when that section is completed.



Five Aerotec Gas Scrubbers of 100,000,000 standard cubic feet per day capacity, manifolded to handle 500,000,000 SCFD on the "Big Inch" station at Poplar Bluff, Missouri.

# THE INDUSTRY SPECIFIES:

# AEROTEC *Dry* GAS SCRUBBERS

On the "Big Inch" pipeline and at the wells, Aerotec Gas Scrubbers are performing with unparalleled efficiency the job of keeping pipelines free of dust, liquid and distillates.

Based on a dry process of separating foreign material from gas, the Aerotec method eliminates the need for a cleaning medium, insures a minimum carryover of foreign matter into the gas stream. Units are available in practically any size up to 100,000,000 SCFD. Larger capacities may be handled by manifolding these standard units to any desired capacity.

Acceptance of Aerotec Gas Scrubbers is best demonstrated by the rapidly growing list of new users. Repeat orders prove that the Aerotec method is setting a new standard for an industry where maximum efficiency is required.

Complete information on this new method is now available.
*Write for Catalog 501-2W today!*

***Project and Sales Engineers***

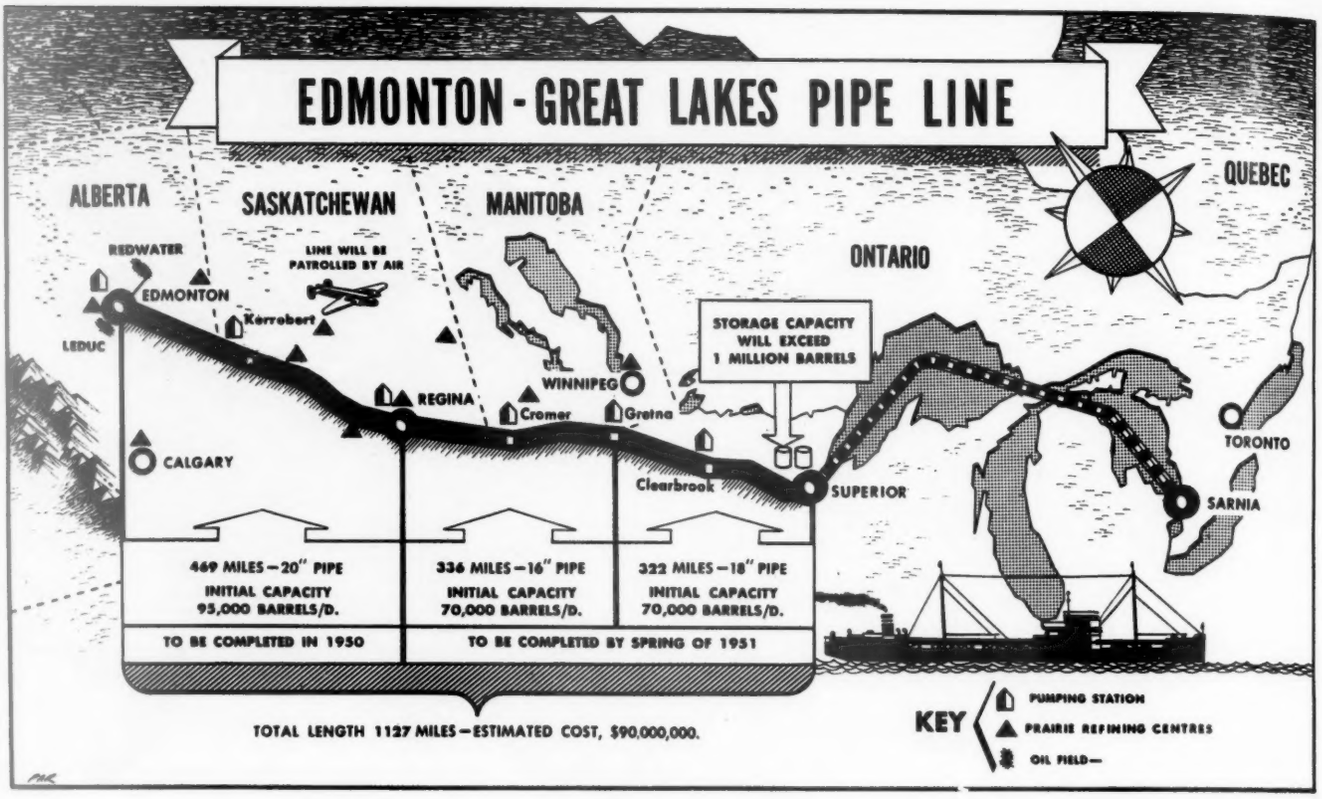
## THE THERMIX CORPORATION

**Greenwich, Connecticut**
*(Offices in 28 Principal Cities)*

***Canadian Affiliates:*** T. C. CHOWN, LTD., 1440 St. Catherine St., W., Montreal 25, Quebec
50 Abell St., Toronto 3, Canada

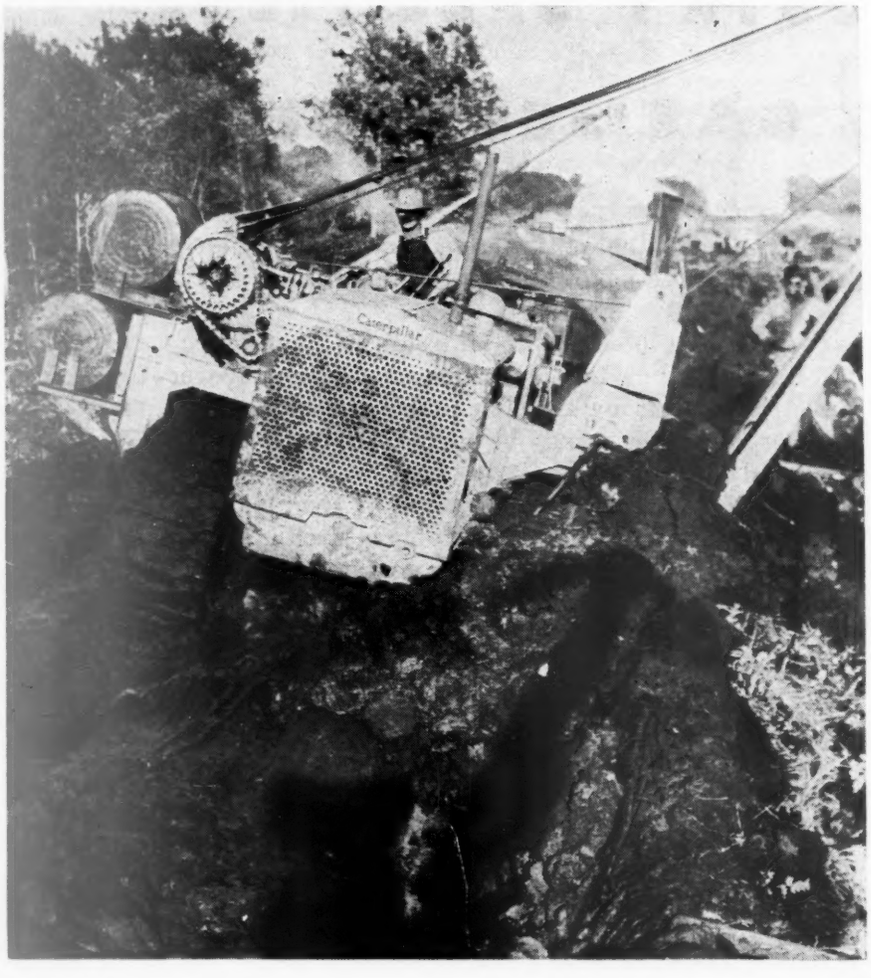
# THE AEROTEC CORPORATION

**GREENWICH, CONN.**




One tread of this sideboom tractor disappears in mud. This is near Manitou, Manitoba on the spread working northwest from Manitoba-North Dakota border.

*Heath-King Studios photo, Edmonton*




tween Edmonton and Regina and 70,000 bbl a day from there east to the terminus. A 50 per cent increase in capacity can be effected by the addition of six more stations.

The mileage, then, for the three sections is 439 miles of 20-in., of which 82 miles has a wall thickness of 11/32 in., the remainder 5/16 in.; 336 miles of 16-in. having a wall thickness of 5/16 in., and 322 miles of 18-in. having a wall thickness of 9/32 in. These mileages, together with 30 miles connecting the Redwater field with Edmonton, give an overall length for the project of 1127 miles.

Line pipe, comes in 40-ft joints. Steel specifications call for 0.20 to 0.25 carbon and 0.50 to 0.75 manganese. The pipe is cold expanded by internal hydraulic expansion, which increases the yield point. The pipe is protected from corrosion by the application of coal tar enamel reinforced with glass wrap and an additional wrap of coal tar impregnated asbestos.

The relative cold climate of Canada at certain seasons of the year made it necessary to give particular consideration to the depth at which the line should be buried. The study made in this respect indicated that by burying the pipe 3 ft below ground surface the temperature of the oil during winter operation would be between 25 and 30 F.

Pipe used in river crossings has a wall thickness of ½ in. Concrete river

# QUICK ACCEPTANCE *in the gas transmission field!*

**Pipe line companies purchase over 60 Worthington uniflo design TYPE UTC-16 angle gas engine compressors**

It takes time — and actual working conditions — to show how equipment stands up. That explains the keen interest of transmission companies and refineries when the first commercial installation of Worthington's new Angle Gas Engine Compressor TYPE UTC-16, was dismantled for inspection. After 2763 hours of continuous operation — under full load and frequent overload — it was found that:

- **All parts were carbon-free,** demonstrating the marked superiority of Worthington uniflo scavenging over conventional loop scavenging for reducing wear.
- **Pistons and liners were still well within shop tolerances,** and the high polish on the entire liner surfaces indicated A-1 operating condition.
- Rings showed minimum wear, with tool marks still visible.
- Bearings were all in perfect condition.

### *A Success From The Start*

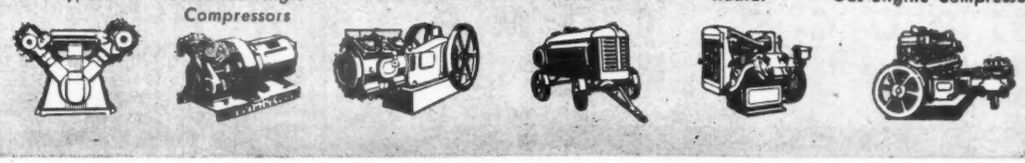
Shop tests had already proved TYPE UTC-16's more thorough scavenging, and perfect combustion. Now, this far more conclusive field test proved the ability to assure these benefits over a long, trouble-free service life. And a steadily growing list of purchasers has established TYPE UTC-16 as a real history-maker in the development of more efficient, more economical gas transmission.

Why not investigate the many advantages of joining this list? Get the whole story that proves *there's more worth in Worthington* from our nearest District Office. Or write to *Worthington Pump and Machinery Corporation, Engine Division, Buffalo, N. Y.*

**WORTHINGTON**

EK-0-3

NO OTHER COMPRESSOR WILL OUTPERFORM A WORTHINGTON



weights are used to hold the pipe in the river bed and extra coating and wrapping are given to protect the pipe. Construction crews operated from the frozen river surface late last winter to install crossings of the North Saskatchewan near Edmonton and Battle River. near Hardisty, Alberta. The South Saskatchewan River crossing was installed during a low-water period this summer.

### Special Tankers

From the Superior terminal two of the largest freshwater tankers in the world will carry the oil through the Great Lakes to Sarnia, Ontario, to form the final link in the transportation system. These are the largest tankers ever built in Canadian shipyards. The *Imperial Redwater* is now under construction at Port Arthur, Ontario, and a sister ship, the *Imperial Leduc*, is being build at Collingwood, Ontario. The vessels were named for the two major Alberta oil fields that will provide the bulk of the pipe line and tanker traffic.

Hulls of the two ships are scheduled for launching in October and they will be fitted out during the winter to be ready for service on the lakes when navigation opens next spring. Each will be 620 ft long, with 68-ft beam, and will carry a cargo of 115,000 bbl of crude oil at 24-ft draft.

Once launched, the empty hulls will be fitted with engines and boilers of Canadian manufacture. Crews' quarters will include recreation rooms for officers and men. Radar, ship-to-shore telephone, and radio direction finders will aid the captains in their navigation, and a fathometer will give the depth of the water through which the tanker is sailing.

Inasmuch as there will be several months during the winter when the lakes will not be navigable, storage capacity at the Superior terminal will need to be sufficient for the pipe line to remain in operation during those months. Consequently, 12 storage tanks are being built. Each will hold 150,000 bbl, which will give a total storage capacity at the terminal of 1,800,000 bbl. The tankers will draw from this storage as well as from the pipe line at an estimated average rate of 57,000 bbl a day.

To provide ships with berths for loading and unloading, new dock facilities are being prepared at Superior and Sarnia. The former Ogdenburg pier at Superior has been reinforced with sheet steel piling and dredges have deepened the dock approaches for the big tankers. A new dock will be built at Sarnia by spring. This will be a 610-ft dock, entirely new, that will cost an estimated $500,000.

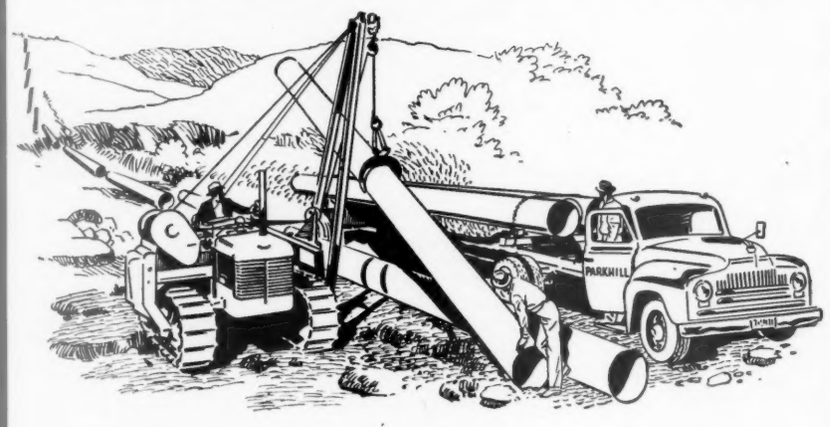
Loading facilities at Superior have been designed to put oil on board the tankers at the rate of 20,000 bbl an hr.

### Pumping Stations

Diesel engines driving single stage centrifugal pumps through speed increasers have been selected as the pumping units. These will operate in series to give the desired flexibility of operation under all load conditions. At Edmonton and Kerrobert stations, there will be 4 pumping units consisting of 4 dual fuel engines each rated at 1080 hp at 600 rpm. driving four 8 by 10 by 16 centrifugal pumps, which will provide a standby unit. At Edmonton, six 140,000-bbl tanks are being erected. At Regina and Cromer stations, 3 units rated at 810 hp are being installed. No provision has been made for a standby but a fourth unit is planned for a later date. The Gretna station will have three 540-hp units and the Clearbrook station two 810-hp units. These installations will be sufficient for the initial load.

To make operations as dependable as possible, design of the engine jacket water cooling system, engine lubri-


From LAKE SHORE LINE
To INTERNATIONAL BORDER
*We're Stringing*
328 miles of 18" Pipe
on the
LAKEHEAD PIPE LINE




PARKHILL has strung a lot of pipe in the past 30 years, but we take special pride in the job we are now doing for Lakehead Pipe Line Co., Inc. We are stringing the pipe for the entire line from Superior, Wis., to the Canadian border at Neche, North Dakota ... 328 miles, including the territory across the peat bogs and swamps of the lake country in Minnesota.

*Operating under I.C.C. Permits in 47 States*

ROY F. PARKHILL QUAY MARTIN TRAP BRISCOE

PARKHILL TRUCK COMPANY

2000 E. Jasper St. TULSA, OKLAHOMA Phone 4-6159 4-6150

# WATE-KOTE"

## Something New!

**Designed by Rosson-Richards for the peline industry affording protection to ur pipe and supplying *weight* — elimi- ting the application of old method mps — giving protection to the entire nt at a *saving*.**

t-Kote" on section of Tennessee Gas Transmission Co. 12" line near Holmwood, Louisiana

"Wate-Kote" applied to Tennessee Gas Transmission Co. 26" line near Greenville, Mississippi.

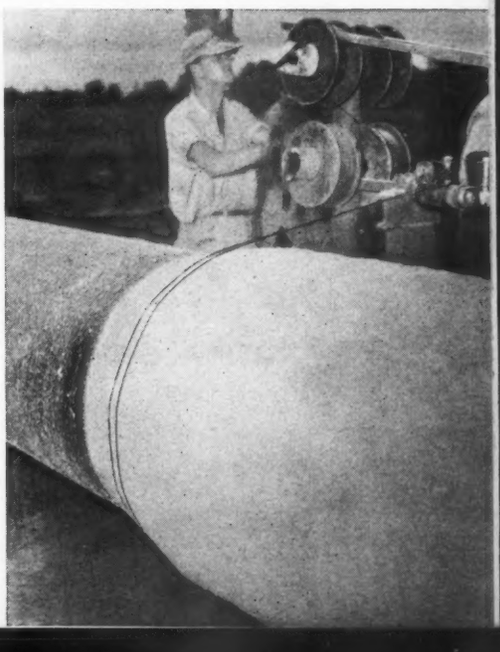
**Durable under all conditions—extremely useful on river crossings and in marsh lands where *weight* and *protection* is essential. "Wate-Kote" is a protective coating against marine life and can be used in salt water.**

**Rosson-Richards, in developing "Wate-Kote," has brought to the pipeline industry a weight material heavier than ordinary aggregates.**

**FULL INFORMATION UPON REQUEST**

PATENT PENDING

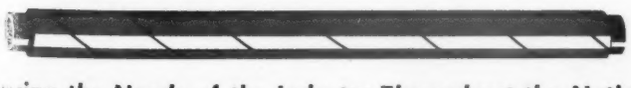
Reinforcement being applied along with "Wate-Kote" on 26" pipe—weighing approximately 330 pounds per foot after application.



# ROSSON-RICHARDS PROCESSING CO.

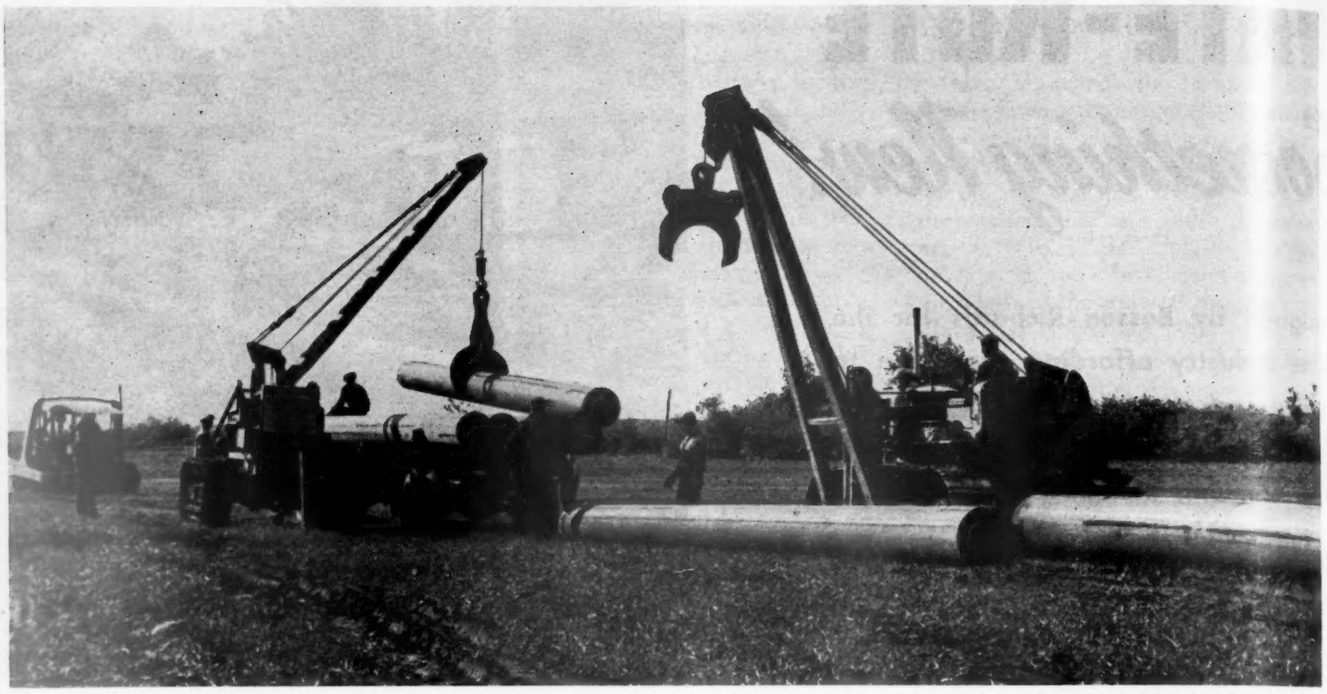
# ROSSON-RICHARDS CO.

**PIPE COATING AND WRAPPING**



*"Serving the Needs of the Industry Throughout the Nation"*

**CORPUS CHRISTI and HOUSTON, TEXAS-JACKSON, MISS.**



*Interprovincial Pipe Line Company photo*

Stringing crews unload 20-in. pipe from trucks, placing the joints on the right-of-way in readiness for pipe line construction crews coming up behind. Near Killam, Alberta.

cating cooling system, and the engine fuel oil purification system were given special attention, and automatic controls are being provided to shut down the pumping units in event of failure in any of these auxiliaries.

Further, as the pipe line will be operated as a closed system, instrumentation has been included in the design to hold pressure surges to a minimum. By means of a high flow metering device on the discharge of each station a warning can be given to the station personnel should a major line break or leak occur downstream from that station.

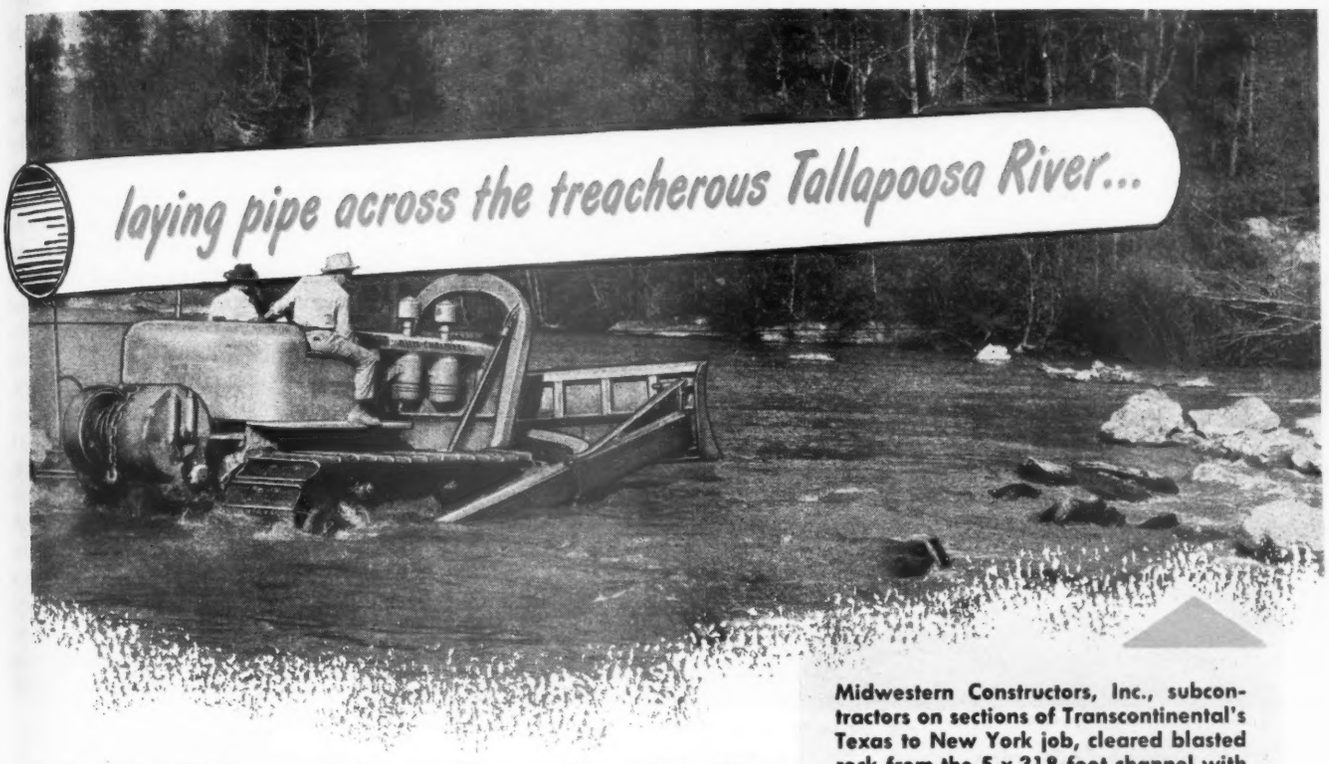
Because of extremely cold weather conditions that will be encountered at certain seasons, pump station buildings are being constructed of steel frame and masonry walks and will be unitized as much as possible. The heating systems for these buildings, which will be 75 ft by 200 ft by 24 ft high, also are being given special consideration. The principal source of heat will be from waste heat boilers, one to each engine, which will absorb heat from the exhaust gases and generate steam at about 15-psi pressure. The waste heat boilers will generate about 1 lb of steam per operating horsepower and will be supplemented by automatic oil-fired boilers.

### Operation This Year

Before construction work began on the line a 150-day schedule was set up for its completion. Operations, therefore, will begin late this year, except for lake shipments. With open weather in the spring and lake shipping again possible, the tanker movement between Superior and Sarnia will get under way. Then, it is estimated, western production will be in-

In flat western farmland the pipe line ditch holds a straight course. The boom shown is part of a "clamshell," which aids ditching machines at spots where rocks or cave-ins are encountered.

*Interprovincial Pipe Line Company photo*




Midwestern Constructors, Inc., subcontractors on sections of Transcontinental's Texas to New York job, cleared blasted rock from the 5 x 318-foot channel with this HD-19. 'Dozed out boulders weighing several tons . . . sometimes water was over operator's platform.

After HD-19 side boom tractors guided the 30-inch gas pipe into position, another HD-19 winched the sections, as they were welded, through the swollen waters and swift currents. Another important and tough job spearheaded by HD-19's — world's largest tractors!

# A tough Alabama job, made easier with Big, Rugged Allis-Chalmers HD-19 Hydraulic Torque Converter Tractors

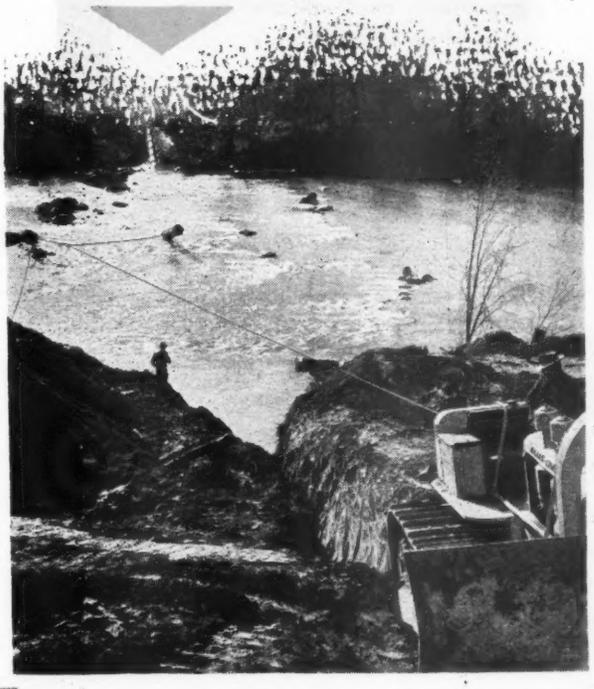
Some Reasons Why HD-19's Are Preferred By Pipeline Contractors:

**GREAT LIFTING CAPACITY** A big, powerful tractor with 40,000 lb. of properly balanced weight, the HD-19 easily handles the largest, heaviest pipe. Equipped with a boom, it can lower-in pipe from a position of 10 to 12 feet from edge of trench . . . thus prevents cave-ins.

**UNUSUAL FLOTATION ABILITY** Creeps along over soft going . . . doesn't dig itself in or get hung up on stumps. Has unusually high clearance and long, 28-inch, extra wide, sure-gripping tracks . . . plus the torque multiplying characteristics of the torque converter that permit you to move heavy loads with velvet-like smoothness.

**OUTPERFORMS IN ANY GOING** Easily pulls heavy equipment—like bending machines—up steep grades and through soft going. The torque converter drive automatically synchronizes HD-19's speed with the equipment being pulled or pushed — no shifting. An important advantage when working with cleaning and priming or doping and wrapping machines!

**OUTMANEUVERS** Shifting is practically eliminated — only two forward gear ratios — 0 to 3 and 0 to 7 mph. Operator just "guns" the throttle when pipe is lowered-in, gets in front of other tractors in a hurry and quickly maneuvers into position. Steering is hydraulic . . . braking is self-energizing — no tiresome pulling and pushing of levers and brakes.

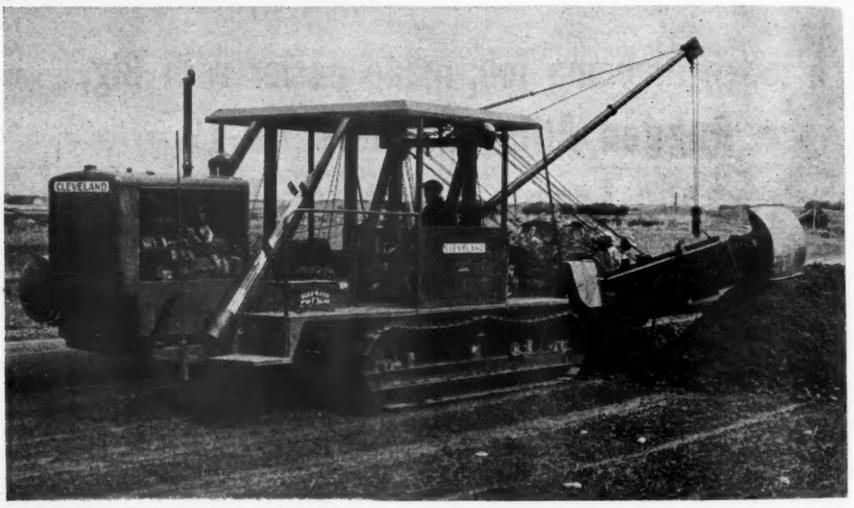


**ALLIS-CHALMERS**
TRACTOR DIVISION · MILWAUKEE 1, U. S. A.
*Originator of the Torque Converter Tractor*

★ **Get the full story on this new kind of tractor from your Allis-Chalmers dealer . . . NOW!**

*Interprovincial Pipe Line Company photo*

Welders at work on 16-in. pipe. This spread is near Kipling.




Flat prairie land in dry weather permitted ditching machines to make good progress about 100 miles southeast of Edmonton.

*Interprovincial Pipe Line Company photo*

A long section of welded and primed pipe line awaits application of protective materials by coating and wrapping crews in rolling country near the Battle River valley at Hardisty, Alberta.

creased to a minimum of 100,000 bbl a day.

The 150-day working schedule makes this the fastest major pipe line construction job ever undertaken. The speed with which the line is being constructed is prompted by two factors; (1) The short construction season, and (2) the line's influence on Canada's economy. Exploration and development programs since the Leduc discovery have increased western Canada's proved oil reserve to an estimated 1,000,000,000 (billion) bbl. As recently as 1946 these reserves were placed at 72,000,000 (million) bbl. Marketing of Alberta crude outside the prairie region is uneconomical at present because of the high transportation cost. Consequently, the western Canada oil fields are held to a production of about 61,000 bbl a day, which all goes to prairie refineries. These wells could be producing at more than double that rate and still remain within the allowables fixed by the Alberta Conservation Board.

Refinery capacities in Saskatchewan, tributary to the Edmonton-Regina section of the line, now total approximately 24,130 bbl a day, and the estimated 1951 capacity is for 30,400 bbl a day. By 1951 capacities tributary to the Regina-Gretna section are expected to total about 17,000 bbl a day. During the open season it is expected that an average of about 57,000 bbl a day will be shipped by lake tanker to Imperial's refinery at Sarnia and to refineries at Petrolia and those in the Toronto area.

The following tabulation indicates the projected 1951 capacities of Canadian refineries situated on or adjacent to the pipe line in Saskatchewan and Manitoba, those served by the Great Lakes water system by lake tanker from Superior, and those situated in Alberta but not expected to be served by the line:

YOU GET **GREATER FLEXIBILITY** IN

# NEMCO CONTROL STATIONS

"NEMCO" Class 441 Explosion-Proof, Heavy Duty Control Stations offer an unusual degree of flexibility.

They are furnished in five sizes of enclosures to provide for the mounting of from one to five control devices. As a result, the sequence of controls can be varied to suit practically any scheme of operation. Different devices which can be mounted in any one of the unit positions include:

*Push-button station; selector switch; pilot light; mushroom cap; emergency break-the-glass station; maintained contact start-stop interlocking pushbutton (requires 2-unit station); etc.*

"NEMCO" Heavy Duty Control Stations can be furnished for either surface or flush mounting. Designed for Class 1, Group D Hazardous Locations, they are made from high tensile gray iron which is produced in our own foundry.

WRITE TODAY FOR NEW 10-PAGE BULLETIN No. 441

Size 1 enclosure is for one control unit such as pushbutton, pilot light, selector switch, etc. Sizes 2, 3, 4 & 5 also furnished.

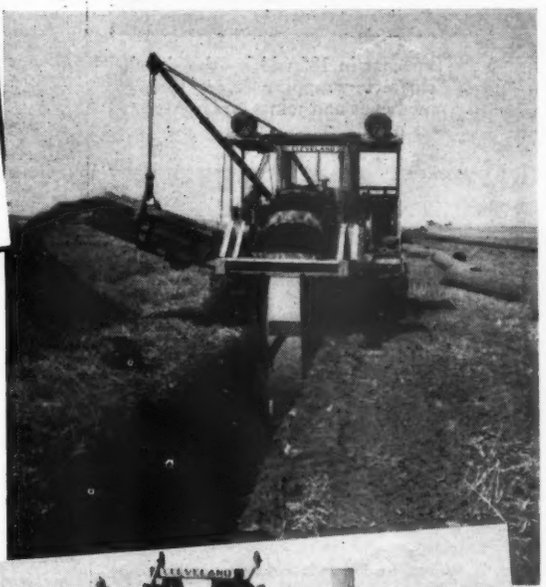
Shown above is Size 5 enclosure which will accommodate five different control units. Write for Bulletin No. 441.

NELSON *Electric* MANUFACTURING CO.

217 N. Detroit St. TULSA, OKLAHOMA Telephone 2-5131

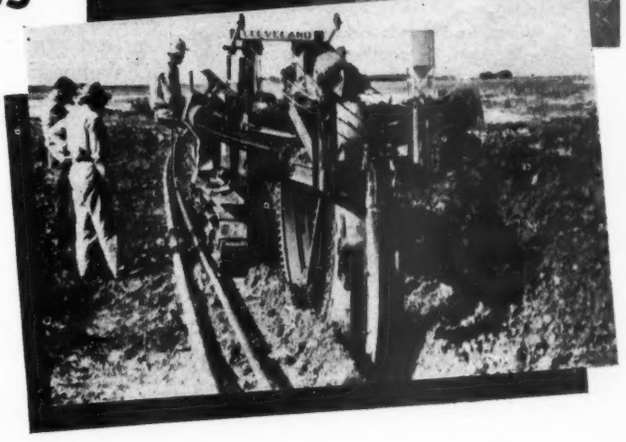


**lease lines — field lines — water lines gathering, transmission and distribution lines ...pipelines large and small**



# CLEVELANDS

## ARE MONEY-MAKERS ON *ALL* THE TRENCHING JOBS



Because CLEVELANDS give you the last word in fast modern efficient production on all your trenching work —long or short lines, tough or normal—with important savings on operating costs and machine investment. Check with your local distributor on the engineering features that fit each CLEVELAND for more different kinds of jobs, that keep CLEVELANDS out in front on yardage production and keep them out of the repair shop—features that add up to the high mobility and maneuverability necessary in oil-field work.

THE CLEVELAND TRENCHER CO.

20100 ST. CLAIR AVENUE CLEVELAND 17, OHIO

TAPECOAT*

The Time-Tested
Coal Tar Coating
in Handy Tape Form

...Sized to the Job

24"

Tapecoat in 24" width is the economical coal tar coating for "cigarette-wrapping" mechanical couplings.

18"

Tapecoat in 18" width—the size for "cigarette-wrapping" sleeves, large pipe bends and joints on large diameter pipe.

6"

4"

3"

2"

Tapecoat in 6", 4", 3" and 2" widths—ideal for spiral-wrapping welded field joints, service connections, pipe under streets and sidewalks, and pipe through building walls, etc.

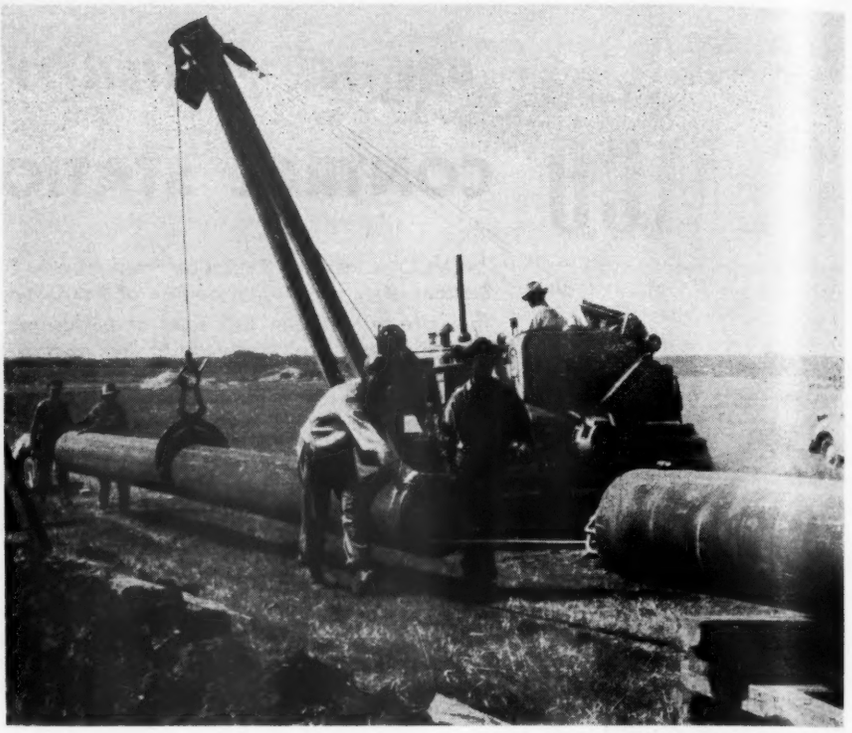
*Write for full details and prices on Tapecoat—the coal tar coating with a width for every purpose.*

* Reg. U. S. Pat. Off.

The TAPECOAT Company

1523 Lyons Street, Evanston, Illinois

489 Fifth Avenue, New York 17, N.Y.; Jas. E. Mavor Co., 514 M and M Building, Houston 2, Texas; 175 Niagara Street, Denver 7, Colo.



*Heath-King Studios photo, Edmonton*

**Sideboom caterpillar tractor moves another 40-ft joint of pipe into place over internal line-up clamp. This spread is 60 miles southeast of Edmonton.**

| | Estimated 1951 capacities, bbl per day | | |
|---|---|---|---|
| | Imperial | Other | Total |
| Saskatchewan and Manitoba refineries on or adjacent to line | 23,700 | 23,700 | 47,400 |
| Sarnia, Petrolia, Toronto area refineries served by Great Lakes water system | 53,000 | 31,000 | 84,000 |
| Sub-total | 76,700 | 54,700 | 131,400 |
| Alberta refineries in or adjacent to producing fields | 25,000 | 16,550 | 41,550 |
| Total | 101,700 | 71,250 | 172,950 |

### Work Program

To carry out the fast construction program, the line was divided into sections for the purpose. The 439-mile section from Edmonton to Regina was contracted to Bechtel Corporation of San Francisco and Fred Mannix and Company, Ltd., of Calgary. The 336-mile section between Regina and Gretna was awarded to Williams Brothers Corporation of Tulsa, and the 322-mile section from Gretna to Superior (Lakehead) was contracted to Anderson Brothers Construction Company of Houston. Parkhill Truck Company of Tulsa is stringing the pipe for Anderson.

The three contractors are each working three spreads, the nine spreads laying a total of approximately nine miles of pipe a 24-hr day in favorable weather.

The five pump stations in Canada, at Edmonton, Kerrobert, Regina, Cromer, and Gretna, are being constructed by the Bird Construction Company, Ltd., of western Canada. The station at Clearbrook, Minnesota, is being built by Walco Engineering and Construction Company of Tulsa.

### Interprovincial Organization

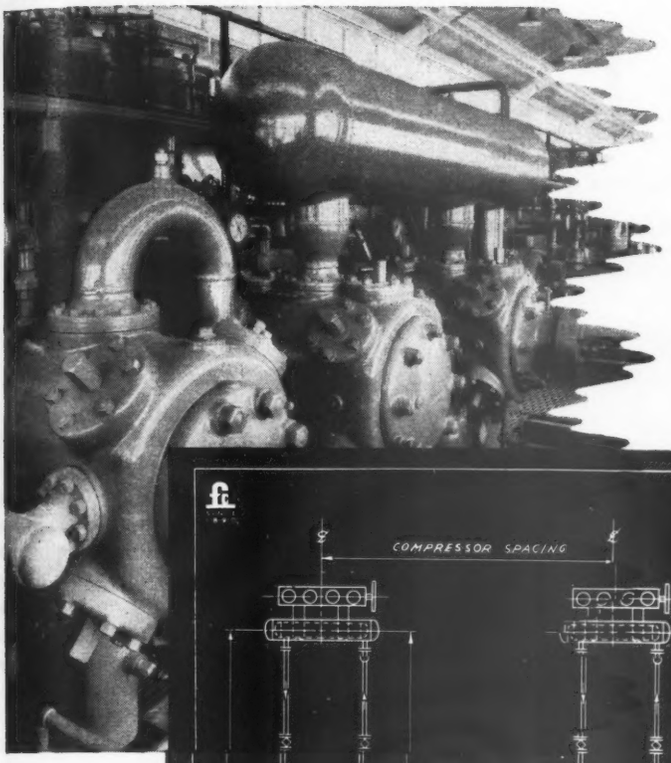
Interprovincial Pipe Line Company was incorporated by a special act of the Parliament of Canada on April 30, 1949. Imperial Oil Limited, as one of the major producers of crude in western Canada fields, promoted the organization of the company, but retained only a one-third ownership. Other oil companies and private interests participate to the extent of 25 per cent and the remaining 42 per cent is in the hands of the public.

Lakehead Pipe Line Company, Inc., is a wholly owned subsidiary of Interprovincial and will own and operate the U. S. portion of the facilities.

Dr. O. B. Hopkins, a vice president and director of Imperial Oil, is president of Interprovincial.

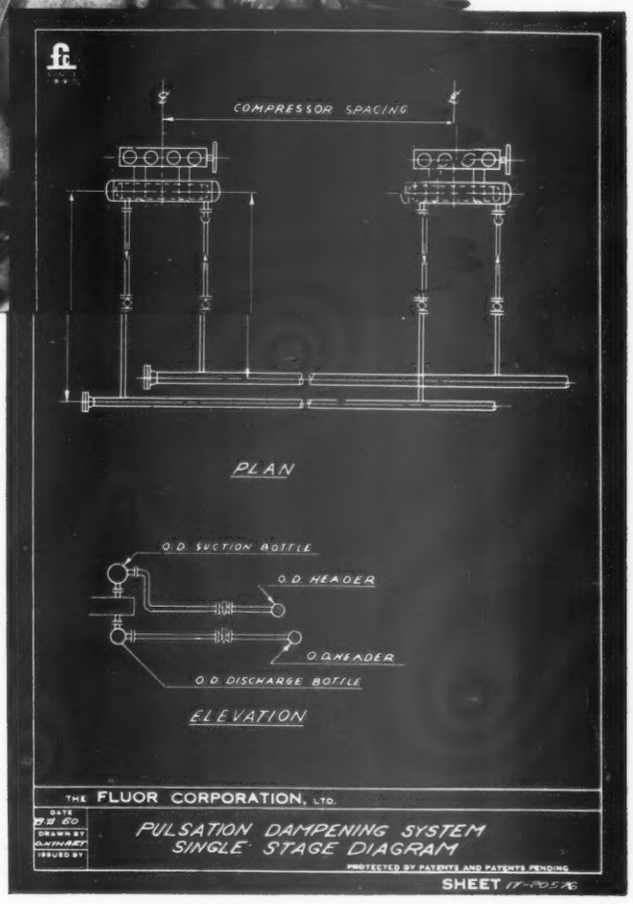
Loren F. Kahle, president of Interstate Oil Pipe Line Company, has been loaned to Interprovincial for a period of 18 months and has been elected executive vice president and a director.

T. S. Johnston, formerly assistant to the vice president of Imperial (supply and transportation), is a vice president and director of Interprovincial. * * *



# FLUOR

## PIPING SYSTEMS ARE DESIGNED FOR PULSE-FREE PERFORMANCE




*A 4-page Bulletin giving detailed information on this "pulse-free" piping system is available upon request.*

The Fluor Pulsation Dampening Piping System is the newest and most practical approach to pulse-free piping yet developed. Furnished in prefabricated form, ready for installation, this modern piping system attenuates objectionable pulse peak pressures caused by the reciprocating action of compressors. The operator is assured of trouble-free piping throughout the life of his plant or station—*at an initial cost comparable to conventional compressor piping systems!*

Design of the system is such that conventional volume bottles, laterals and headers are utilized to provide the appropriate components of an acoustical filter—the basic principle of the long-proven Fluor Pulsation Dampener. By choice of line size and arrangement, Fluor's pulsation dampening principle is incorporated as an integral part of initial compressor piping design. This involves no radical departure from the physical appearance of conventional piping systems, except for a reduction in the number of extraneous devices usually required to anchor piping.

Fluor Pulsation Dampening Piping Systems are *guaranteed* to provide a steady, smooth gas flow with minimum pressure drop. Because of this steady flow, many advantages are realized by the operator. Safety is increased by eliminating vibrational stress on piping, heat exchanger and vessels. Compressor operating efficiency is increased, metering inaccuracies caused by pulsative flow are reduced, and maintenance problems common to conventional piping systems are cut to a minimum.

### COMPARABLE IN INITIAL COST...

Fluor Pulsation Dampening Piping Systems are designed primarily for new construction. Furnished in prefabricated form, the system is comparable in first costs with conventional piping systems. More important, though, are the savings possible in being able to design and specify related equipment based on a system *free* of pulsative flow and its attendant problems.

Include the Fluor Pulsation Dampening Piping System in your thinking when contemplating new construction. Fluor Engineers are available to explain in full the advantages of this modern piping system—*from the design stage on through the life of your plant!*

**FLUOR**

BE SURE WITH FLUOR

DESIGNERS AND CONSTRUCTORS of Refining, Natural Gas and Chemical Processing Plants.
MANUFACTURERS of Mufflers, Pulsation Dampeners, Gas Cleaners, Cooling Towers and Fin-Fan Units.

THE FLUOR CORPORATION, LTD., 2500 S. Atlantic Blvd., Los Angeles 22, Calif. Offices in principal cities in the U.S.A.
REPRESENTED IN THE STERLING AREAS BY: Head Wrightson Processes Ltd., Teesdale House, Baltic St., London, E.C.I., England

# Microwave on Long Systems*

***Discussion of the requirements for pipe line service, design of equipment, planning and making installation, and operating costs for multiplex radio relay network.***

M. G. STATON†

PUTTING it in a nutshell, a multiplex microwave radio relay system can provide all the facilities of a conventional pipe line aerial wire line system with improved realiability at a lower cost per year.

What is a multiplex microwave radio relay system?

First, microwave equipment is that type of radio equipment peculiar to the highest end of the radio frequency spectrum. As we go higher and higher in the radio frequency spectrum the radio wave exhibits characteristics more and more like those of visible light. Such characteristics, namely, diffraction, refraction, reflection, and obstruction, become more and more evident at microwave frequencies. There are certain frequency bands in this high end of the spectrum we are interested in for operational use by pipe line systems. They are: 890-940 mc, 952-960 mc, 1850-1990 mc, 2110-2200 mc, 2450-2700 mc, 6575-6875 mc, and higher bands. Frequencies above 6875 mc appear to have characteristics that make them undesirable for this type of service.

Second, a microwave radio relay system can be described as a series of microwave radio equipments situated at fixed positions along, we will say, a gas pipe line. These equipments provide a fixed communication system along the pipe line much like that of a pole line carrying wires.

Third, by multiplexing the microwave radio relay system we can permit a number of conversations and other functions such as facsimile, teletype, telemetering, and supervisory control to be carried simultaneously over the same radio circuit without objectionable interaction or interference with each other.

There are many ways of transmitting a number of communication channels simultaneously over the same radio circuit. These can be broken down into two basic systems: Frequency division multiplexing and pulse multiplexing, each of which has certain advantages and disadvantages.

Advantages of frequency division multiplexing over pulse multiplexing are:

1. Frequency division systems are more conservative of band width and this will become a very important factor as microwave systems are installed throughout the country.
2. Frequency division multiplexing offers the possibility of a higher grade of performance.
3. Frequency division multiplexing lends itself more readily to channel dropping, channel insertion, and party line operation.
4. Frequency division multiplexing utilizes conventional equipment that has been used for years on wire line service.
5. Tube replacement costs are lower for a frequency division system.

Advantages of pulse multiplexing over frequency division multiplexing are:

1. Pulse multiplexing relaxes the linearity requirements of the repeater stations.
2. Pulse systems can probably be obtained at a lower cost than the frequency division systems.
3. More power is obtainable from a pulse transmitter than a continuous wave transmitter.

### Features of System

What features should a multiplex microwave relay system have?

The microwave radio equipment should be so designed that channels can be dropped or inserted at will at the various repeater stations without the addition of a great deal of equipment or the deterioration of the other multiplex channels passing through the repeater station. The equipment should permit party line connection at the repeater stations on a bi-directional basis. In other words, a telephone connection at a repeater station should permit talking in either direction along the radio system without a complicated switching system and objectionable sidetone.

A microwave relay system having many unattended stations must have a fault locating system incorporated in the equipment that will automatically indicate to the maintenance points the location of failures. This is an absolute necessity if an efficient maintenance procedure is to be maintained and the length of outage is to be kept at a minimum.

The radio equipment should include provisions for adding standby equipment. The amount of standby equipment required for a typical system will be determined by the type of traffic being handled, the quality of maintenance personnel being utilized, terrain over which the radio system operates, and length of outage that can be tolerated. Some systems will require 100 per cent standby from end to end whereas others will require standby equipment only at selected locations where accessibility is a problem. Under certain conditions it may be desirable to incorporate diversity reception and the equipment should be so designed that diversity receivers can be added without equipment modification.

Pulse systems must be kept in synchronism and this usually requires that a synchronizing pulse be transmitted along with the channel pulses. Unless special equipment is incorporated at the repeater station, a break may throw an entire system out of operation due to loss of the synchronizing pulse. This requires that each repeater station in a pulse system be so equipped that the synchronizing pulse be regenerated if there is an equipment failure at any point in the system. This is also true of continuous wave systems that have repeater sta-

| System | Relative power required | Relative bandwidth |
|---|---|---|
| PCM-FM... | 0.49 | 0.49 |
| PCM-AM... | 0.65 | 0.49 |
| SS-PM..... | 1.0 | 1.0 |
| PAM-FM... | 1.8 | 1.1 |
| PPM-AM... | 2.2 | 9.1 |
| FM-PM..... | 3.0 | 2.1 |

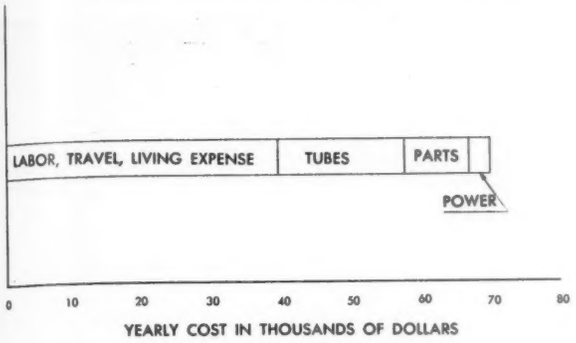
System assumed to have 12 Channels, RMS signal to noise ratio 65 DB per link and each system designed to give this result with minimum power.

Reference — V. D. Landon "Theoretical Aspects of Various Systems of Multiplex Transmission" RCA Review, Vol. 9, No. 3, September 1948.

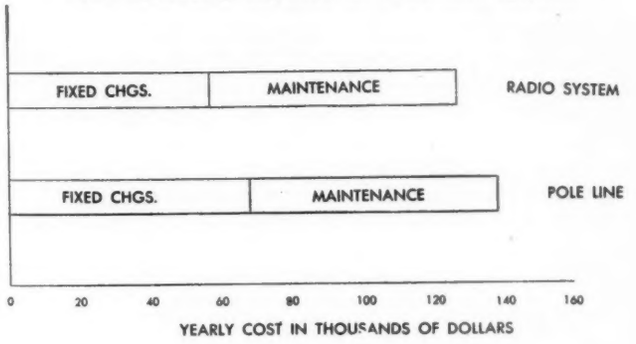
*Presented before Petroleum Industry Electrical Association, Houston, Texas.

†Manager, Microwave and Channeling Sales, Radio Corporation of America.

Maintenance cost of 1000-mile system.




Total operating expense of 1000-mile system.




tion transmitter frequencies controlled by the terminal stations. In other words, the system should be so designed that if there is a break at some point along the system, each portion of the system will continue to work on each side of the break.

### Operating Characteristics

What operating characteristics should a multiplex microwave relay system have?

The basic equipment must be engineered by a top-flight group of engineers having a wealth of background information regarding peculiarities of equipment operating under continuous service in this newly opened portion of the radio frequency spectrum. They must know how to design the equipment to obtain the maximum in tube life. The equipment must be designed with the maintenance problem continually in mind. All components must be quickly accessible and of the highest standards.

Power consumption should be held to a minimum and the equipment should be insensitive to power supply, frequency, and voltage changes.

There should be designed into the equipment an ample margin for fading. This is also an economic problem involving tower spacing, transmitter power, antenna gain, and the desired system reliability.

### Planning System

The preliminary planning can be divided into three parts, which are to a certain extent dependent upon each other.

The first step consists of laying out a simple block diagram of the required communication channels. It is essential that the direction and type of transmission be indicated, for a microwave radio relay system is actually, in most instances, two systems, one for each direction along the pipe line. Therefore, the quantity and type of multiplex equipment for providing the specific channels will often differ for each direction of transmission, depending upon the number and type of

Our New Office Is

NOW LOCATED IN

THE M. & M. BUILDING

HOUSTON, TEXAS

PRestON 0423

RUMSEY BROS.
PIPE LINE CONTRUCTION
COMPANY

IT'S AN
O K JOB IF
O KLAHOMA CONTRACTING
DOES IT!

You can depend on Oklahoma Contracting to give you the very best in experience, know-how and equipment when it comes to Pipeline Construction. In the roughest of weather and over the most difficult terrain, Oklahoma Contracting will carry on and get the job done.

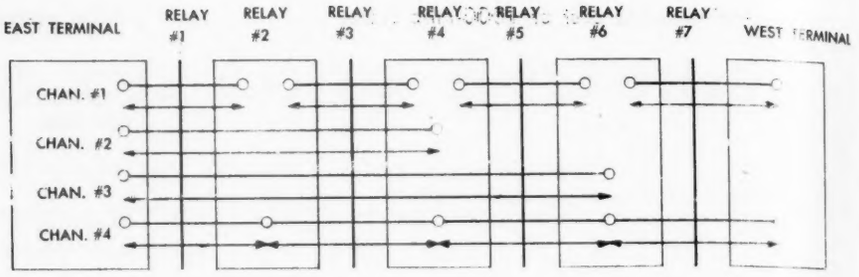
Oklahoma Contracting Corporation

COMMERCE BUILDING
HOUSTON, TEXAS

MERCANTILE BANK
BUILDING
DALLAS, TEXAS

channels required in each direction.

The second step is a paper study of the route to be followed. This study can be greatly facilitated if USGS maps are available for the areas involved. The fixed station sites are usually spaced 25 to 35 miles apart depending upon the nature of the terrain being crossed and the maximum tower height desired for ease of installation and maintenance. As mentioned before, the radio wave at microwave frequencies acts much like a light wave and as a result the curvature of the earth becomes our limiting factor. We depend upon the reception of the direct wave rather than a reflected wave. Over flat terrain masts or towers about 50 ft high at each end of a 20-mile path will provide a radio beam path that just grazes the surface of the earth at the midpoint. Actually we require, in most instances, 50 to 100 ft of clearance between the radio beam path and the highest points on the earth's surface along the path. These high points include trees and buildings that may be in the path.




BLOCK DIAGRAM OF A RADIO RELAY SYSTEM.

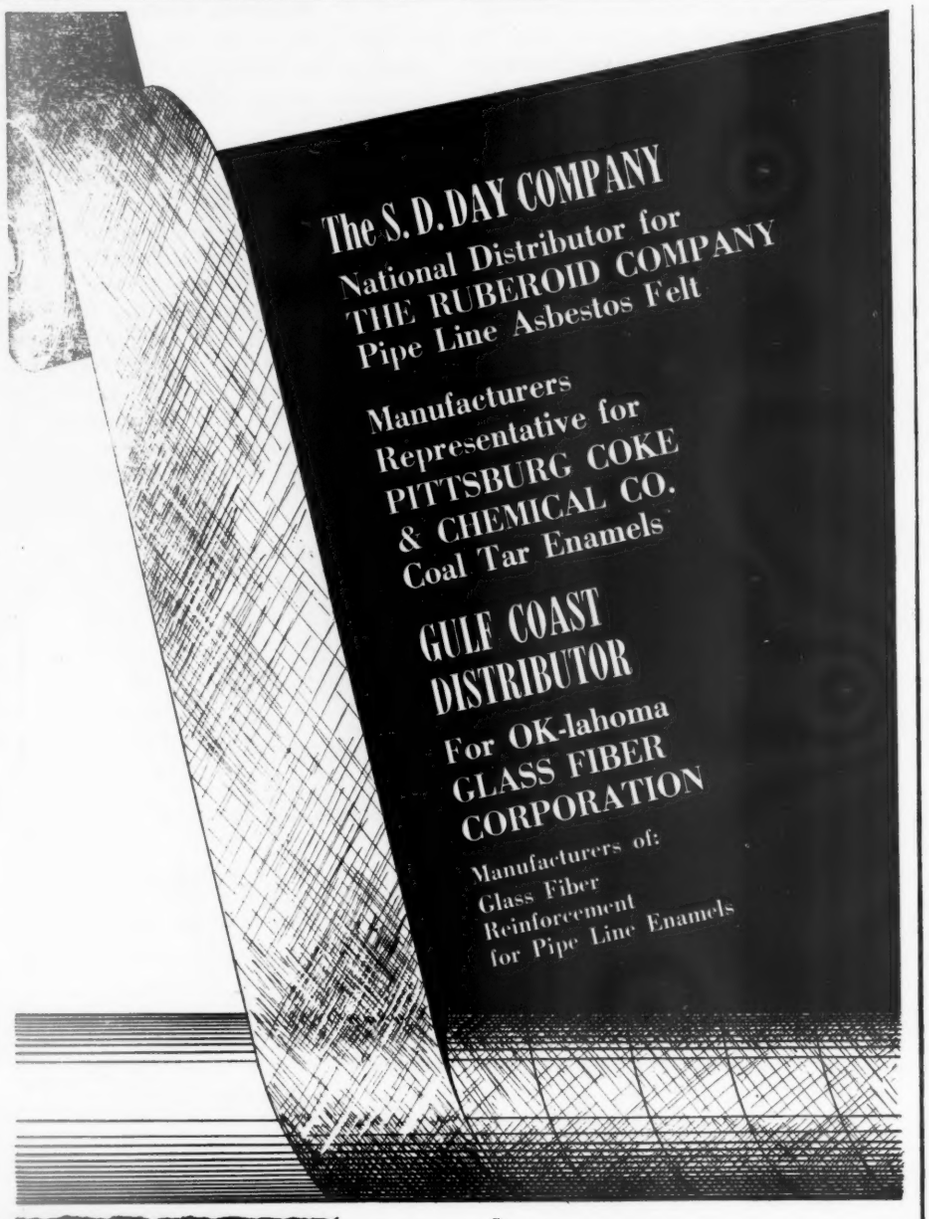
This may seem like a serious problem and at times it is. As a rule, however, it is often possible to select favorable locations with elevations higher than the surrounding area and thereby decrease the height of the towers required. Lack of suitable maps for a system covering an extended area may require an aerial survey. This is not an expensive procedure, for a properly equipped plane can cover the proposed route rapidly and provide path profile data that would be less accurate and more expensive if obtained by means of ground reconnaissance.

Having spotted the proposed stations and possible alternate locations by use of USGS maps or an aerial survey, the third step is a field inspection of the proposed sites to determine the amount of clearing and road construction required and the length of power line that must be built by the power company or the pipe line company to bring commercial power to the station location. Having checked the locations, a propagation test over a portion of the paths is necessary to confirm or correct the calculated space loss. This last step will determine the antenna gain and the tower height required for each location.

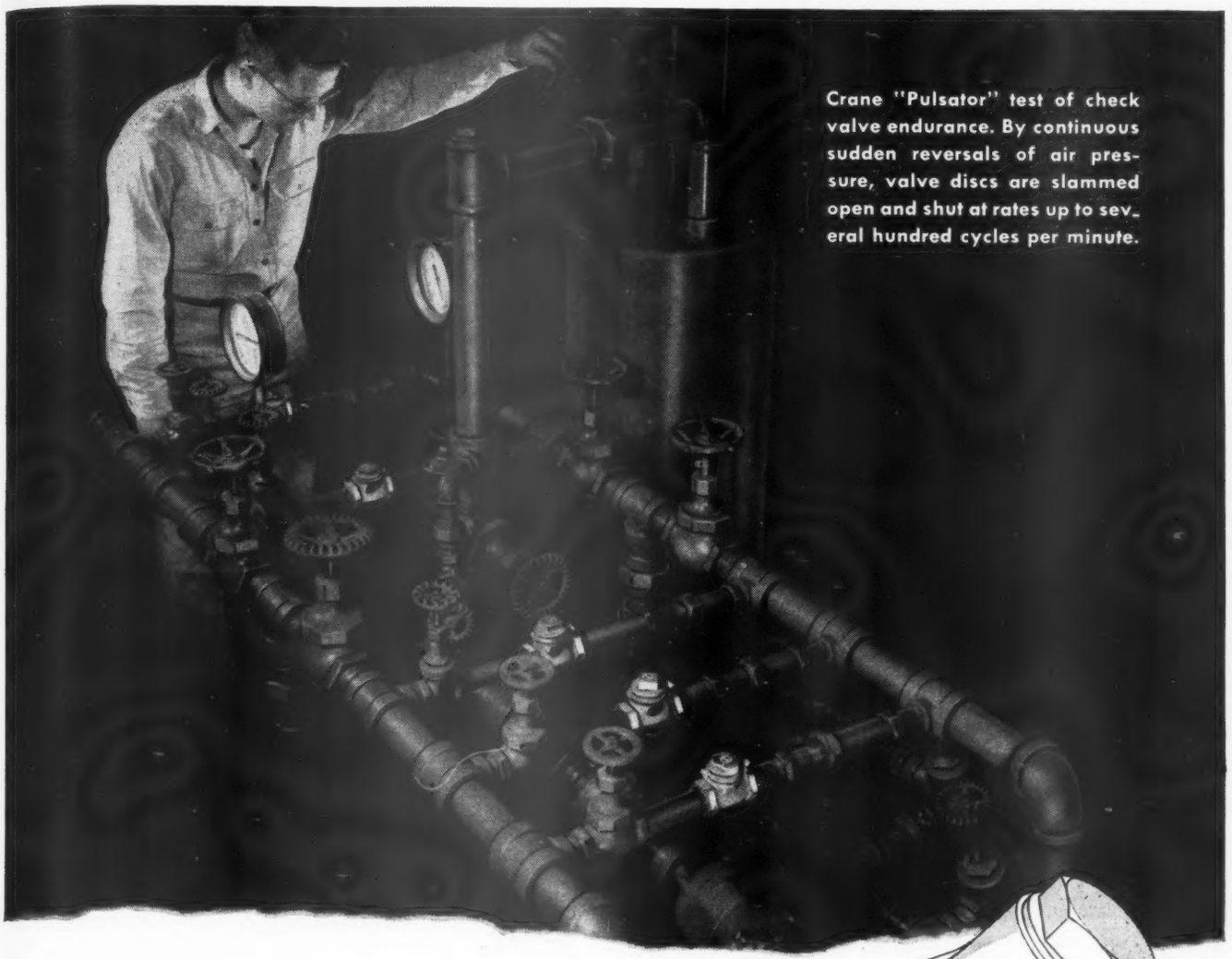
### Installation

When the field study information is combined with the system block diagram the entire list of equipment required for the installation can be compiled. When ordering the equipment it is generally more economical to have the equipment bays assembled and wired at the factory to simplify the installation work in the field.

If the pipe line company intends to maintain their microwave system, it is important that the men selected for the maintenance work be employed in the installation work. In this way they

More **CRANE VALVES** are used than any other make



Crane "Pulsator" test of check valve endurance. By continuous sudden reversals of air pressure, valve discs are slammed open and shut at rates up to several hundred cycles per minute.

## How Many Checks in a Good Check Valve?

You don't buy them that way, but that's what finally determines the value of check valves in your pipe lines. That's why Crane is so completely equipped for accurately pre-testing valve performance. For instance, "wearability" of check valves is tested by opening and closing the valves continuously on various fluids under conditions of actual service. Special equipment is used to accelerate these tests to equal many years' service in a short period. Countless tests like this—of materials, designs, and finished products—insure the superior performance values that mean lower piping costs for users of all Crane valves and fittings.

This new regrinding Brass Swing Check design typifies Crane's continuing product development for better valve performance, lower piping maintenance costs. For increased flow capacity . . . for fast, positive closure on backflow . . . for easier servicing without removing valve from line . . . get a demonstration of these 200 and 300-Pound Y-Pattern Check Valves. Phone your Crane Representative, or ask for literature.

# CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Ill.
*Branches and Wholesalers Serving All Industrial Areas*

**VALVES • FITTINGS • PIPE • PLUMBING • HEATING**

will be well schooled in how the various units are interconnected. The installation work, of course, will be under the guidance of trained engineers.

Ample time must be allowed for system line-up and test after the equipment is installed. It is foolish to assume that a multiplexed radio relay system involving many stations can be turned over to traffic the day after the equipment is installed. During this period the maintenance men can become familiar with the operation of the equipment and the technique of setting levels of operation in the various parts of the equipment. There should then be a period of actual operation with maintenance by the regular personnel under the guidance of one or more trained engineers.

### Operating Costs

Let us see how much we should expect to pay for a typical system. The three principal items making up the total operating cost of a microwave radio relay system are maintenance labor, tube replacements, and amortization of the initial construction cost. Such items as interest, taxes, power consumption, gasoline for emergency power supplies, replacement parts, and property rental do not affect the operating cost to any great extent.

Let us assume that we have installed a 1000-mile microwave radio relay system at a cost of $500 per radio mile or $500,000 for the entire system. If we amortize the electrical equipment over a 10-yr period and the towers and buildings over a 20-yr period our fixed charges will be approximately as follows per year:

| | |
|---|---|
| Amortization | $42,000 |
| Interest | 10,000 |
| Taxes | 5,000 |
| Total | $57,000 |
| Cost per radio mile | $ 57 |

Now let us consider the operating costs confronting us after the system is in operation. Let us assume that the average path length for our system is 25 miles, which results in a total of 40 stations if we count the two end terminal stations as one relay station. Except for maintenance labor and tube replacements the balance of our operating costs will be roughly:

| | |
|---|---|
| Commercial power .750x280x40 | $8,400 |
| Replacement parts, radio | 2,200 |
| Emergency power supply repairs | 400 |
| Emergency power supply fuel | 730 |
| Emergency power supply major overhauls | 550 |
| Total | $12,280 |

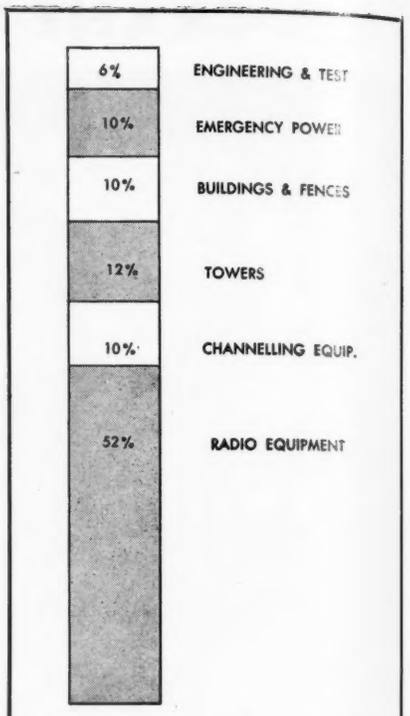
### Maintenance Labor

Maintenance labor is not as much of an unknown item as might be expected. This is true if the radio system has the following heritage:

1. A basic radio equipment that has been engineered and designed by an engineering group thoroughly familiar with the problems peculiar to multihop radio relaying, continuous operation, and maintenance.

2. Equipment that has been manufactured by skillful labor from finest grade components.

3. Field installation made to conservative standards.



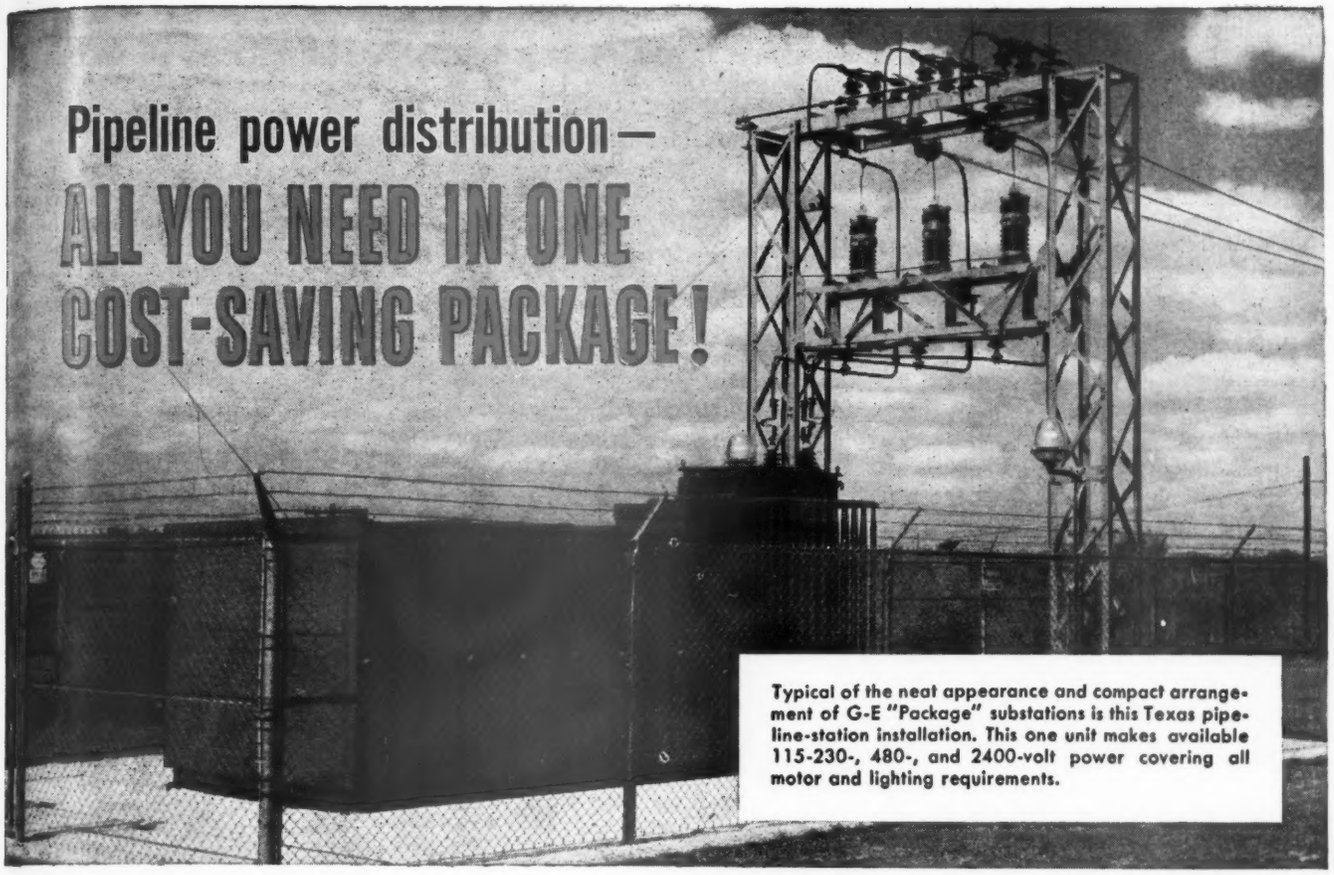

Breakdown of initial construction cost.

4. Thorough, careful, efficient maintenance labor.

The operating group for the pipe line should first determine what maximum outage time can be tolerated for the pipe line communication system. This takes into consideration failures of a type that we might normally expect with a well engineered system. By far the greatest number of failures will be due to tube failures. We have found that the major portion of outage time for a typical failure is spent in getting a maintenance man to the location of the trouble. Proper equipment design should permit him quickly to locate the trouble and correct it. This means that if a system cannot tolerate a normal outage longer than 2 hr in length we must station our maintenance men within 1½ hr trav-

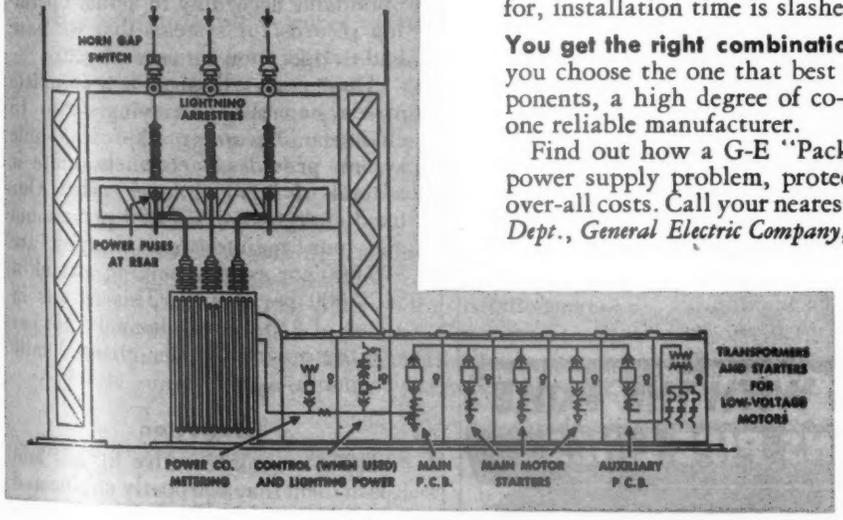
MERCOID
SOLVES INDUSTRY'S AUTOMATIC CONTROL PROBLEMS
THE ONLY 100% MERCURY SWITCH EQUIPPED CONTROLS
The distinguishing feature of Mercoid Controls is the exclusive use of Mercoid hermetically sealed mercury switches. These switches are not subject to dust, dirt or corrosion, thereby assuring better performance and longer control life.
Pressure
Thermostats Line Voltage
Temperature
Explosion Proof
Thermostats Low Voltage
Liquid Level
Float Operated
Oil Burner Safety
Transformer-Relay
If you have a control problem involving the automatic control of pressure, temperature, liquid level, mechanical operations, etc., it will pay you to consult Mercoid's engineering staff—always at your service.
Complete Mercoid Catalog sent upon request.
THE MERCOID CORPORATION, 4201 BELMONT AVE., CHICAGO 41, ILL.

# Pipeline power distribution—
# ALL YOU NEED IN ONE COST-SAVING PACKAGE!



Typical of the neat appearance and compact arrangement of G-E "Package" substations is this Texas pipeline-station installation. This one unit makes available 115-230-, 480-, and 2400-volt power covering all motor and lighting requirements.

**What's in the "Package?"** It comprises a complete outdoor steel switching structure—plus a master unit substation. The switching structure may include lightning arresters, disconnecting switches, buses and bus supports, potential transformers and current transformers, relaying and metering equipment, and outdoor oil circuit breakers (or fuses). The unit substation includes transformers and in the switchgear section, motor starters. Ratings are from 750 to 45,000 kva, at incoming voltages from 11 to 69 kv and outgoing voltages up to 13.8 kv.




This one cost-saver—a General Electric "Package" substation—combines *all* the electric equipment your pipeline station needs between incoming utility lines and all motor and lighting circuits. Ordered, designed, and built as a single unit, it comes complete, co-ordinated, ready-to-install.

**You reduce system cost** Because you don't have to order the components piecemeal, you save engineering cost, as well as time and trouble. And because the entire unit arrives in large, factory-built sections, installation expense is less.

**You save time** Less drafting and manufacturing time is needed because the over-all design is already largely complete, and the components are in stock or can be built repetitively. With no bottleneck parts to wait for, installation time is slashed.

**You get the right combination** From scores of standard combinations, you choose the one that best fits your needs. You get the finest of components, a high degree of co-ordination, and responsibility centered on one reliable manufacturer.

Find out how a G-E "Package" substation can solve your pipeline's power supply problem, protect your continuity of operations, help cut over-all costs. Call your nearest G-E office for more information. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

**Power supply for pipeline stations** is one of many subjects vividly shown in "Lease on the Future," General Electric's "More Power to America" full-color and sound movie on oil field electrification. Ask your nearest G-E office to arrange a showing for you.

*Everything you need to cut oil pipeline costs —electrically!*

GENERAL ELECTRIC

661-16

eling time from the most distant location in their territory. Assuming a man can travel 60 miles in 1½ hr, he can service 5 to 6 stations or 150 to 180 miles of radio circuit. On this basis a 1000-mile circuit would require approximately 7 men. Such things as rivers, accessibility of stations, traffic congestion, etc., must be taken into consideration when maintenance men are assigned territories. These factors increase the number of men required, so an actual installation 1000 miles in length may require 10 instead of 7 men.

It is expected under actual conditions a maintenance man will spend half his time maintaining the radio equipment. The balance of his time can be assigned to other duties along the system. If each man is paid $350 a month and he travels approximately 500 miles a week, the maintenance labor will cost approximately $40,000 a year for the 1000-mile system.

### Tubes

A typical repeater station will have something in the order of 35 receiver type tubes. If the average life of these tubes is 6000 hours, the replacement cost for these tubes per year for a 1000-mile system is approximately $2000. Therefore, it is evident that even if the conventional type tube cost is doubled, it is not a controlling factor for a system.

The transmitter output tube, however, is a different matter. There will be about 80 transmitter tubes in this 1000-mile system if there is one in each transmitter. Transmitters having amplifiers as the output stage will double the number of special type tubes. A magnetron of klystron with sufficient power output costs approximately $200, even when purchased in large quantities. At a unit cost of $200 and an average life of 2000 hr, our annual replacement cost for the 80 transmitter tubes will be $69,920. It is obvious that such a tube replacement cost is prohibitive and we must expect a much longer transmitter tube life.

We know that the maintenance cost for a pole line carrying a single crossarm of circuits is approximately $70 per mile per year or $70,000 per year for a 1000-mile line. Let us use this figure as our maximum allowable maintenance cost for the radio system:

| | Yearly cost |
|---|---|
| Maintenance labor | $40,000 |
| Receiver type tubes | 2,000 |
| Replacement parts | 3,000 |
| Commercial power | 9,000 |
| | $54,000 |

Deducting this from our $70,000 maximum allowable maintenance cost leaves $16,000 for transmitter tube replacements per year.

Therefore, if our transmitter tubes cost $200 apiece, we must expect them to last one year instead of 2000 hr. This order of tube life appears to be obtainable according to actual operating records for systems that we have had in operation for several years.

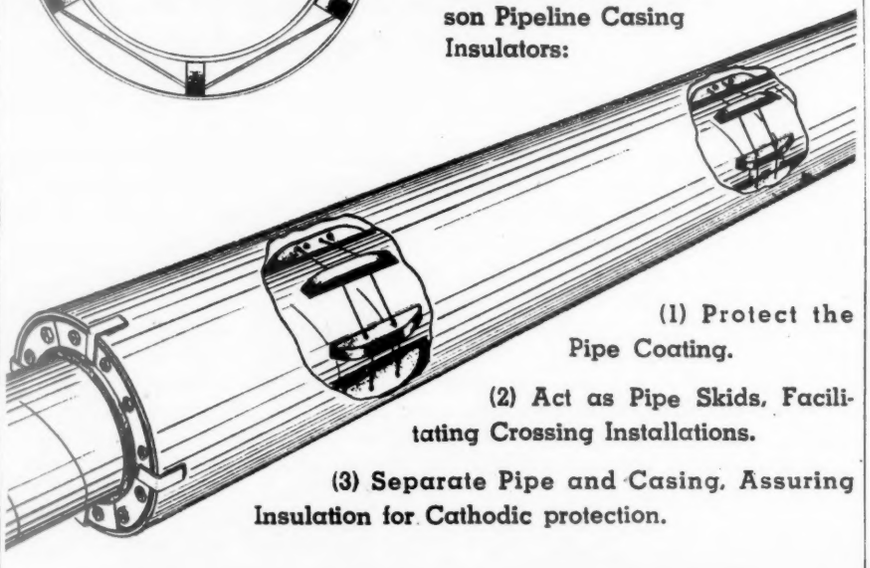
These costs will provide a complete system capable of carrying up to 15 channels. Assuming the 1000-mile system provides 8 channels, there is a total of 8000 channel miles. Our fixed charges are $57,000 per annum and our maintenance charges are $70,000 per annum, making a total of $127,000 per annum. This results in a cost of $15.87 per channel mile per year or only $1.32 per channel mile per month.

### Conclusion

These are conservative figures and it is evident that a properly engineered multiplex microwave radio relay system, properly installed and properly maintained, can provide a pipe line communication system with lower initial cost, lower operating cost, and better performance than any other type of system now in operation. ★ ★ ★


WILLIAMSON "CONCENTRIC SUPPORT"
PIPE LINE CASING INSULATOR*

This improved Williamson Pipeline Casing Insulator approximately centers the line pipe in the casing. This removes support of pipe from "WmSEAL" Casing Bushings, and facilitates their installation. In addition, Williamson Pipeline Casing Insulators:



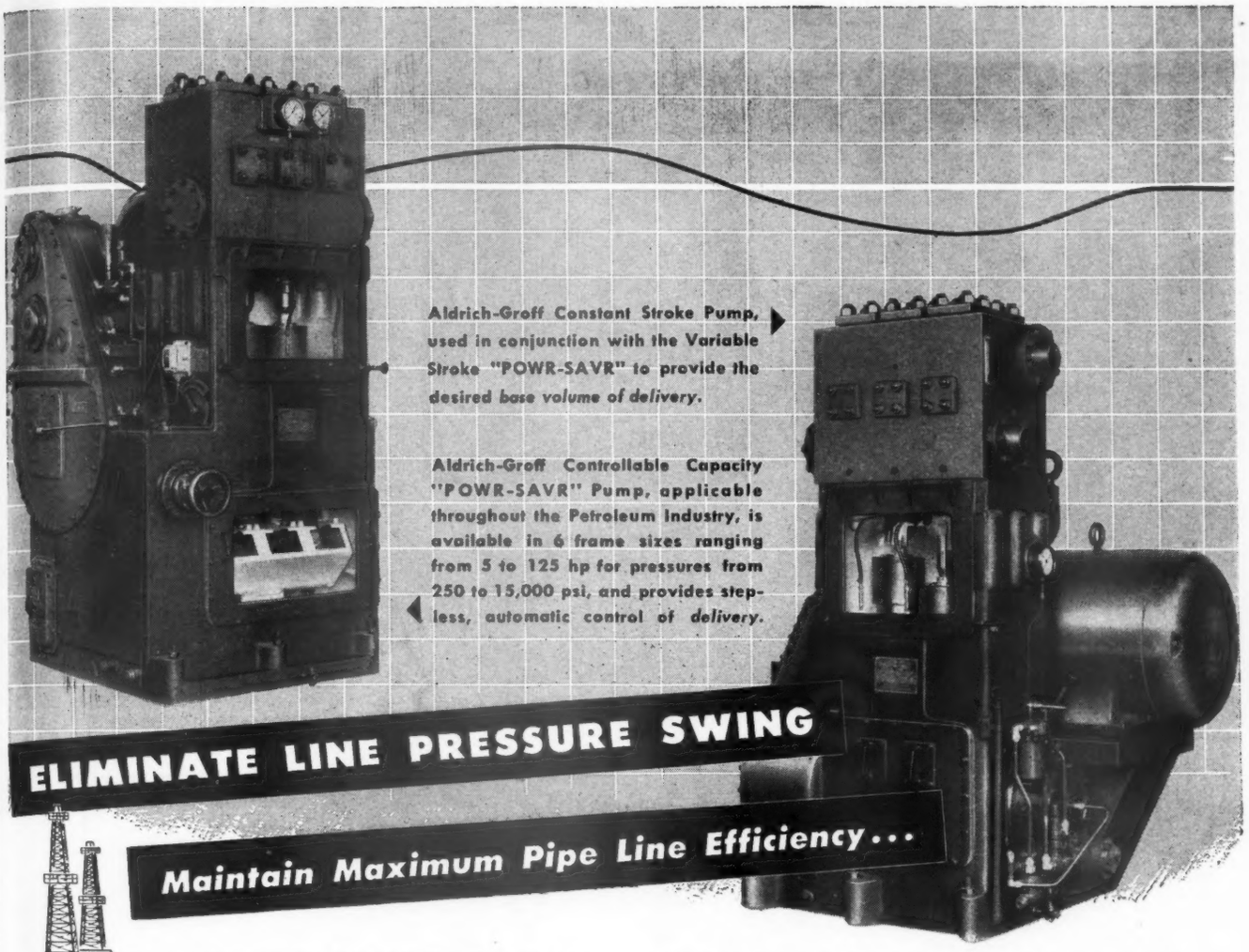
(1) Protect the Pipe Coating.

(2) Act as Pipe Skids, Facilitating Crossing Installations.

(3) Separate Pipe and Casing, Assuring Insulation for Cathodic protection.

THE PIG WITH THE POKE
CLEANS PIPE LINES

T. D. Williamson, Inc.
TULSA 9, OKLAHOMA



Aldrich-Groff Constant Stroke Pump, used in conjunction with the Variable Stroke "POWR-SAVR" to provide the desired *base volume of delivery.*

Aldrich-Groff Controllable Capacity "POWR-SAVR" Pump, applicable throughout the Petroleum Industry, is available in 6 frame sizes ranging from 5 to 125 hp for pressures from 250 to 15,000 psi, and provides stepless, automatic control of *delivery.*

# ELIMINATE LINE PRESSURE SWING

## Maintain Maximum Pipe Line Efficiency . . .

By combining an Aldrich-Groff Variable Stroke "POWR-SAVR" Pump with either its companion Aldrich-Groff Constant Stroke Triplex Units or an Aldrich Multuplex Pump, you can automatically eliminate line pressure swing and safely maintain the maximum rate of delivery in your line at all times. You can also simplify pump station control and eliminate the expense and objectionable features of station surge tanks.

The development of Aldrich-Groff Variable Stroke and Constant Stroke Pumps—to embody *interchangeable fluid-end* and *principal power-end parts* — constituted another notable Aldrich "First". These units are serving on a number of modern high pressure pipe lines with the satisfactory results indicated by repeat orders.

Variable Stroke Pumping Capacity need only cover throughput variations incident to temperature and viscosity changes. The bulk of the installed capacity may be of the less expensive Constant Stroke Units. Such a multiple unit installation not only affords pumping flexibility and extreme reliability, but also lessens the investment for spare unit capacity. And, pumping units need only be installed to care for initial line capacity with additional units being added as the line demands build up. This means less initial investment expense and attainment of full load efficiency under all conditions, with consequent savings in pumping power.

Both types of units employ a *conventional fixed throw crankshaft* of solid forged steel construction which has proven to be best adapted for reliable continuous service, as attested by over 500 units installed so far—many with 10 year service records.

Both units feature self-contained reduction gear drive adapted to utilize an efficient high speed motor or turbine (for refinery service) mounted on the pump frame itself. This not only means compactness of floor space and savings in foundation and building costs—but assures accurate mechanical alignment at all times. V-Belt and other forms of engine drive are optional.

Write for Data Sheet 62 or for our representative to call.

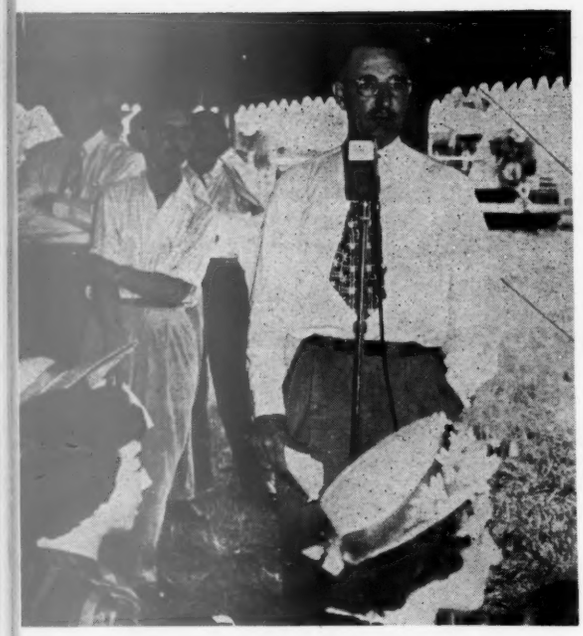
*Representatives:* Birmingham • Bolivar, N. Y. Boston • Buffalo • Chicago • Cincinnati • Cleveland Denver • Detroit • Duluth • Houston Jacksonville • Los Angeles • New York • Omaha Philadelphia • Pittsburgh • Portland, Ore. Richmond, Va. • St. Louis • San Francisco Seattle • Spokane, Wash. • Syracuse • Tulsa

THE ALDRICH PUMP COMPANY

26 PINE STREET, ALLENTOWN, PENNSYLVANIA

*All Aldrich Pumps Have* **STAYING POWER**

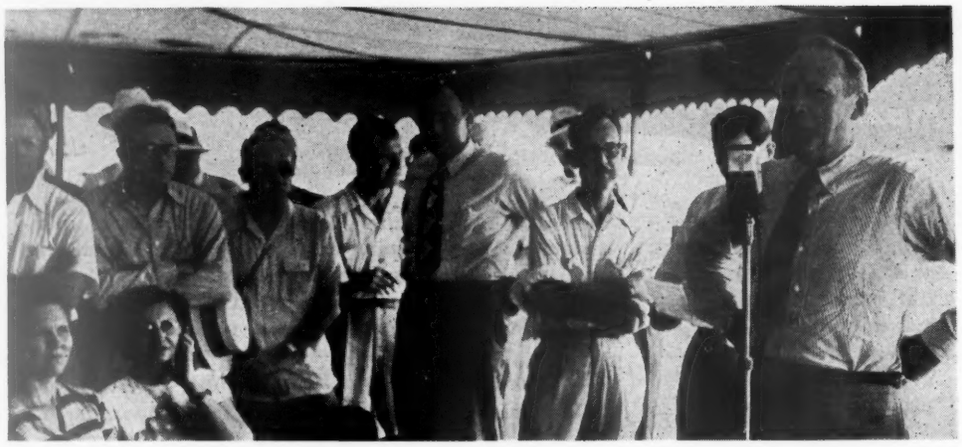
# Pictorial



Joseph J. Hedrick, president, Texas Illinois Natural Gas Pipeline Company, emceed ground breaking ceremonies near Wharton, Texas, marking the beginning of construction of this 1292-mile line.

Mark V. Burlingame, vice president, Texas Illinois, describes the pipe laying equipment on display.

General E. O. Thompson of the Texas Railroad Commission.



James F. Oates, Jr., board chairman of Texas Illinois, and chairman of Peoples Gas Light and Coke Company.

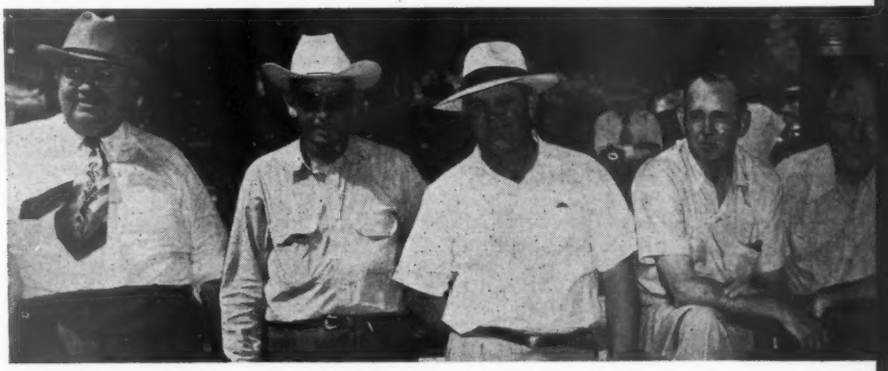
Oscar Hewitt, commissioner of Public Works, Chicago, turns the first spade of dirt.

J. J. Hedrick, center, starts ditching machine while James F. Oates, Jr., board chairman, looks on.

"Dad" Dunn receiving best wishes of friends on his 94th birthday, at annual party given at "Hobby" Dunn's ranch near Ponder, Texas. Badge on left breast was made especially for the occasion, denoting his having served under Captain Watkins in 1871 in the Home Guards, which later became the Texas Rangers. Recognizable in the crowd are J. L. Latimer, Magnolia president; Mrs. Latimer; Luther Tolbert, Lone Star Gas Company; M. W. Staples, Oklahoma Contracting Corporation; Ray O'Connell, Jones, McFarland & O'Connell; Carmen Dunn Schumacher.

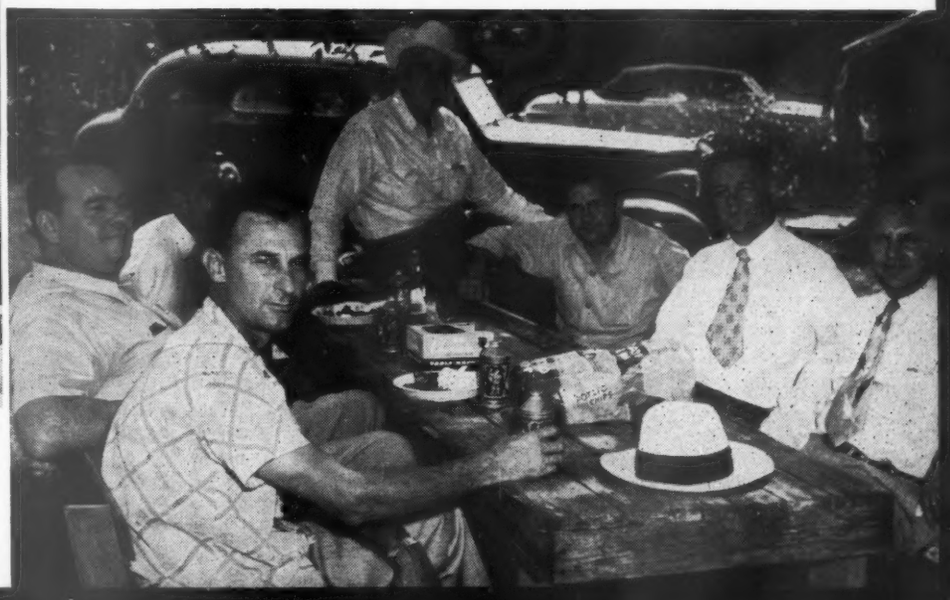
I. C. Little, Texas-Southern Contracting Company; Fred Archer, ranch foreman; J. C. Britton, Britton Contracting; George Brigance, Socony Vacuum; Mr. Lippencott, hotel man.

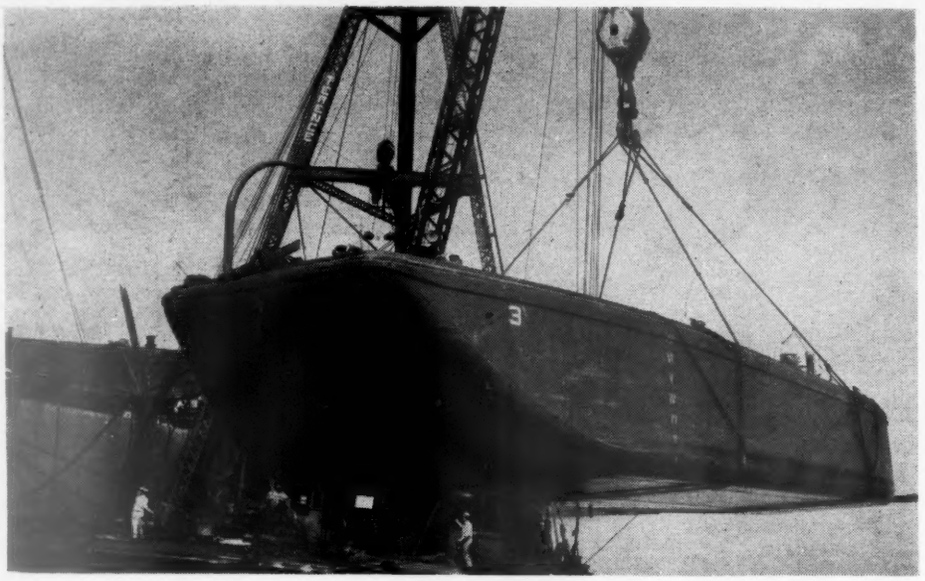
Ed Morrill, new president of Mid-Valley Pipeline Company, up to his old tricks. On the right, Mrs. Morrill and on the left Mrs. Frank Love.



Clockwise: C. L. Young, part owner, Master Tank & Welding; Bill Rawson, purchasing agent, Mid-Valley Pipeline Company; Jim Shipley, chief engineeer, Mid-Valley; "Hobby" Dunn, owner, Eastern Construction Company; Eddie Mellons, sales manager, John Fabick Tractor Company; Hy Byrd, president, F. S. Young, chief engineer, Trunkline Gas Supply.

Tom S. "Ham" Bacon, chief engineer, Lone Star Gas Company, and Mrs. Bacon.





Crane hoists barge from the Mississippi River at New Orleans to deck of Delta Line ship, *Del Santos,* for ocean voyage to Brazil. The three barges were towed to New Orleans from Pittsburgh where they were built by Dravo Corporation.

# Small Barges for Brazilian Service

A FLEET of three small barges especially designed for short distance transportation of gasoline have been placed in service to help the Gulf Oil Corporation's Brazilian subsidiary, Brazil-Gulf (Cia Brasileira de Petroleo Gulf), supply customers in the Rio de Janeiro area.

The all-welded steel barges, constructed and launched at the Pittsburgh Shipyard of Dravo Corporation, were towed to New Orleans and loaded on the deck of a Delta Line ship for the ocean trip to Rio.

Only 77½ ft long, the little vessels can carry approximately 1250 bbl of gasoline with a draft of about 6 ft.

They will operate in Guanabara Bay between Brazil-Gulf's bulk storage terminal on Pancaraiba Island and the company's new distribution terminal just outside the city limits of Rio. In addition, they will be used for deliveries to Gulf customers with shore receiving facilities.

The 8-mile shuttle trip from island to mainland is necessitated by Brazilian government limitations on the amount of gasoline that can be stored on the mainland. Gulf's new distribution terminal is on property assigned by the government for this purpose in the Caju district of Rio. Previously, shuttle barges from the island bulk storage depot had to discharge into tank cars or tank trucks at city docks.

With the new distribution terminal, Gulf will be able to provide better service for its customers in Rio and other Brazilian cities.

The storage capacity at the distribution terminal is approximately 29,000 bbl and facilities are arranged for loading tank trucks and tank cars. There are six storage tanks at the terminal.

Barges will be moored at a concrete pier with 325 ft of water frontage. Depth of the water is only 8 ft, however, which limits the draft of the vessels using the pier. The new barges were designed to carry as much gasoline as possible with a draft of 6 ft or less. They are suitable for towing on a hawser behind a tug in the choppy waters of the bay.

Overall dimensions of the barges are 77½ ft molded length, 22 ft molded width, and 8 ft molded depth. Both ends of the barge are toed in to a width of 12 ft. The stern has a pair of anti-yaw skegs to keep the barge from side-slipping while being towed on a line.

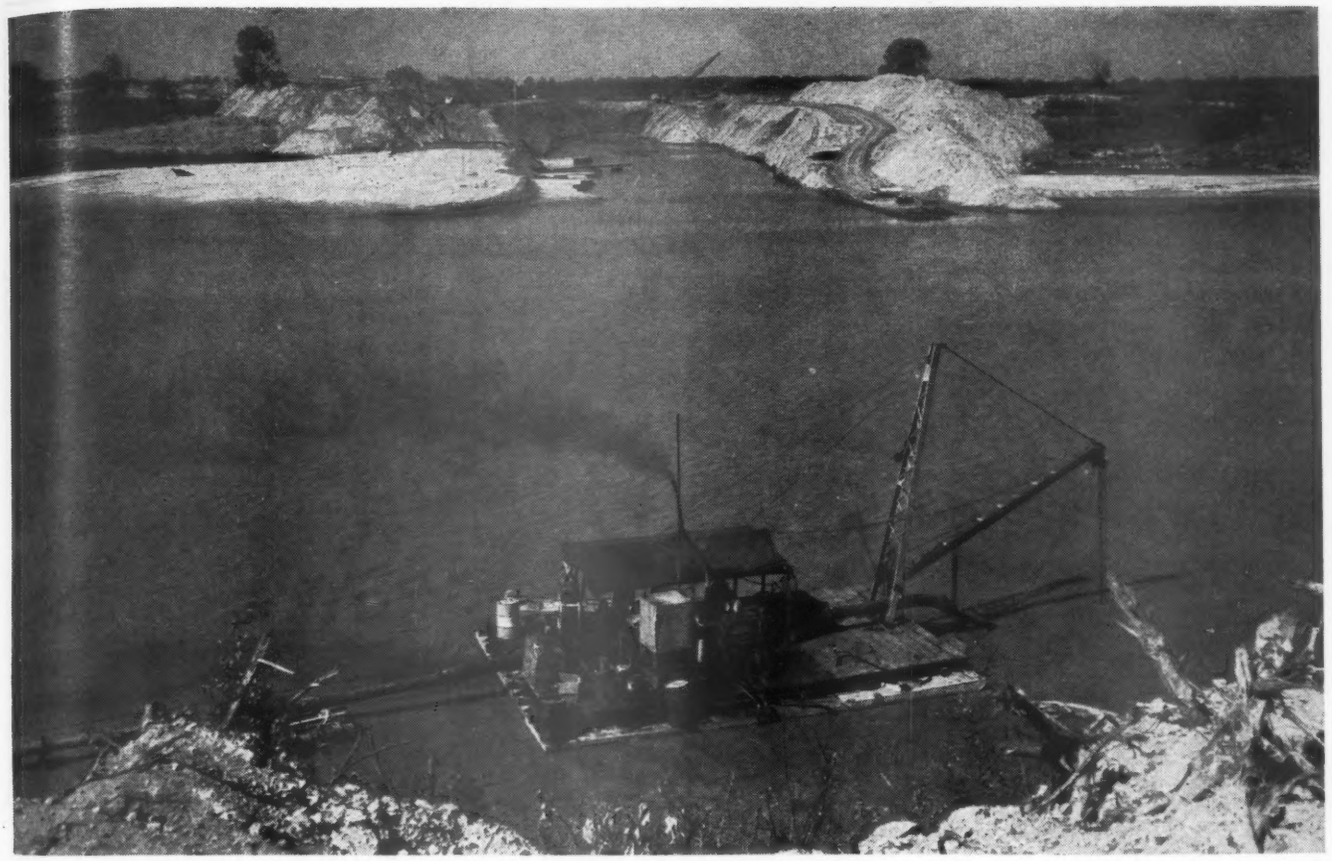
Cargo will be carried in two compartments between the fore and aft collision bulkheads of the vessel. The capacity of one compartment is 3 times that of the second and they are separated by a transverse oiltight bulkhead. The larger compartment has two transverse swash bulkheads to retard movement of the liquid cargo when the compartment is partially filled.

Expansion trunks are fitted on deck toward the aft end of each cargo compartment. These are of 3 ft diameter, 2½ ft high, and have an oiltight hatch on the manhole.

Each barge is equipped with 2 cargo pumps driven by 20-hp, 1760-rpm explosionproof and waterproof electric motors, operating on 3-phase, 60-cycle, 220-440-volt current. A reel of cable is provided alongside the motors for connecting with shore current supply.

Either deepwell pump can discharge cargo from either tank through 4-in. suction lines. This has a double advantage. Two different types of cargo can be carried and discharged without contamination, and one pump can serve both tanks if the other pump is inoperative. Either pump can deliver gasoline at a rate of 350 gpm against a head of 160 ft. This enables them to discharge cargo directly into any of the six storage tanks at the terminal without the need of a booster pump.

Pumps are situated on the stern of the barge and will be shielded with an awning. A small davit is installed to handle the hose lines on the stern and another davit is placed on the how to handle the 750-lb anchor.* *



Dredging ditch in bed of Red River.

# Gas Line to Central Arkansas

*Arkansas Louisiana Gas Company overcomes series of obstacles to complete $8,000,000 project that serves rapidly growing area.*

FRANK H. LOVE*

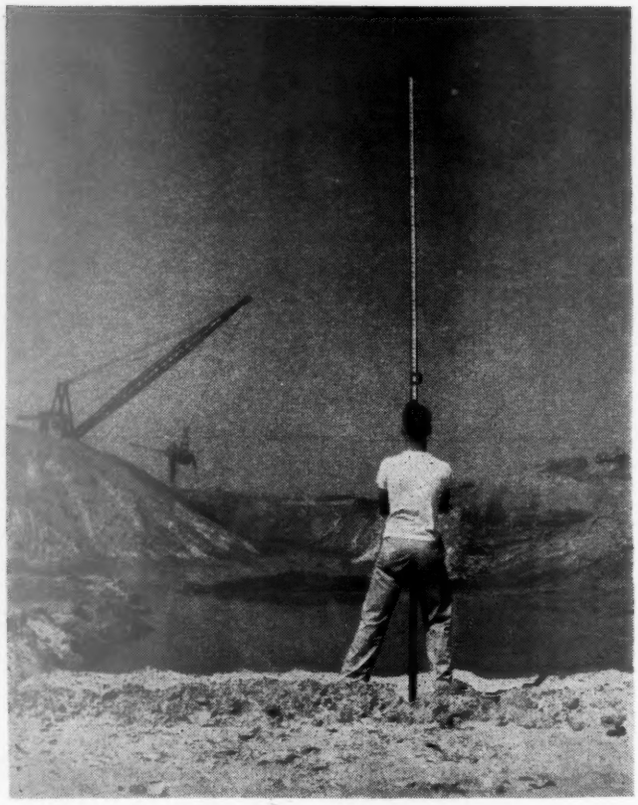
Upon completing the crossing of Twelve-Mile Bayou with a 20-in. main line and 12-in. bypass, and a month of final leak testing and cleaning, Arkansas Louisiana Gas Company put into operation an $8,000,000 pipe line addition to its system to serve the rapidly growing central Arkansas area. This is the major part of a $13,500,000 construction program instituted by the company in 1949.

The new 20-in. line originates in the Waskom field of Texas and extends to Perla, Arkansas a total of 163 miles. It parallels the company's existing system for about 90 miles between the Arkansas Louisiana natural gaso-

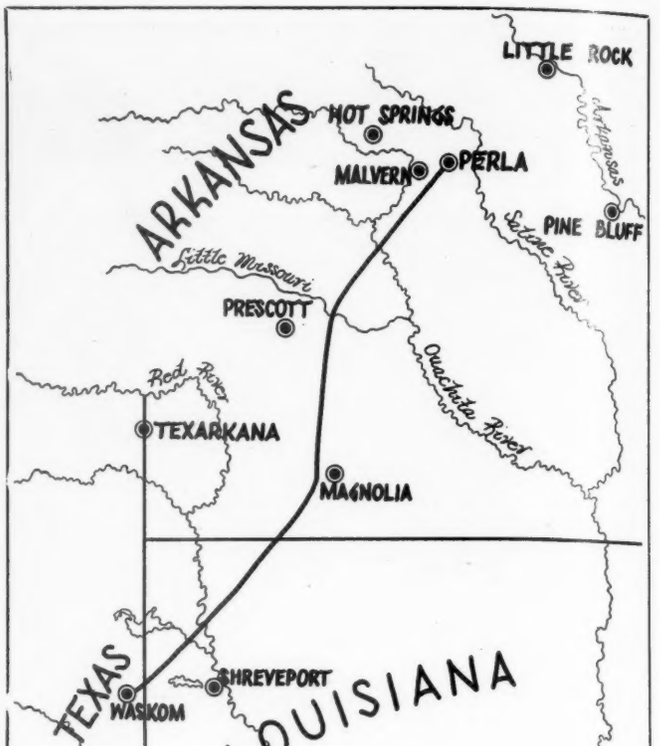
*Oil and Gas Pipelining Editor.

EXCLUSIVE

Rig for boring highway crossing.



Survey crew checks levels for excavation of river crossing.



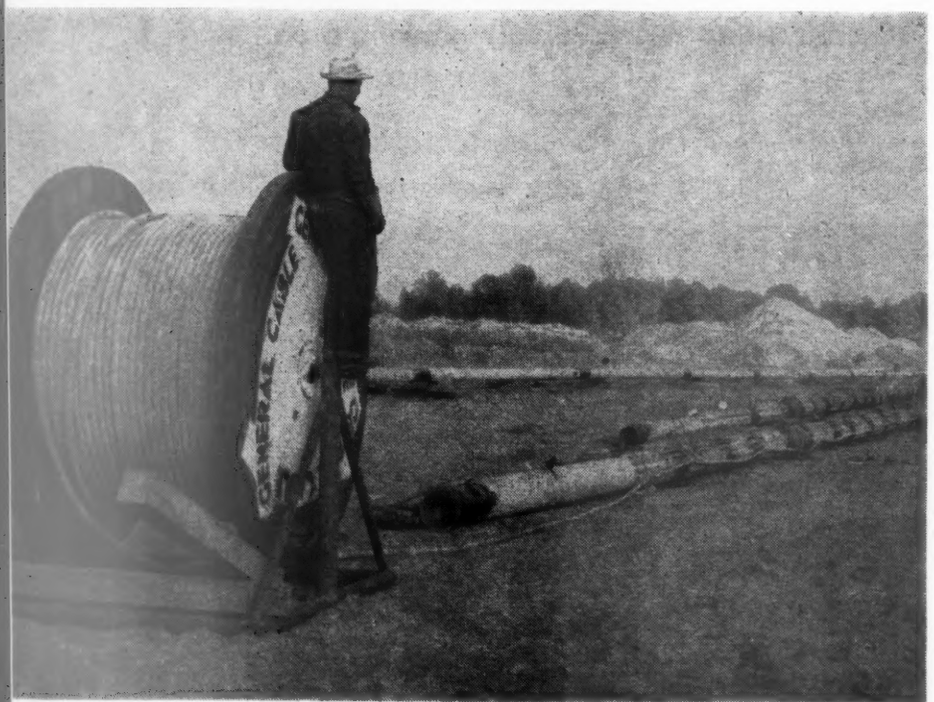

Map showing location of new line.

line plant at Magnolia, Arkansas, and the Perla reducing station near Malvern, Arkansas, final delivery point of the new line and the northern junction of the company's main transmission system in Arkansas. From Perla other lines previously in service transport the gas east to Pine Bluff, west to Hot Springs, and north to Little Rock. In these areas natural gas has been in steadily increasing demand since the end of World War 11. Both industrial and residential customers are being served.

The new line extends northeast from the Waskom field, passes about 30 miles north of Shreveport, where it crosses the Red River, thence almost due north to a point near Prescott, Arkansas, turns northeast again, then passes near Malvern before terminating at Perla.

Permission for construction of the line was granted by the Federal Power Commission in September of last year and the original aim was to have the system in operation in time for last winter's peak load demand. A series of setbacks, however, delayed the work. Many months' time were lost due to the excessive rains alone. Then there were the steel, coal, and railroad strikes. Inclement weather during most of October slowed progress during that month, but the first major obstacle in a series of obstacles was the Missouri Pacific Railroad strike. This was eventually settled but it delayed scheduled deliveries of pipe. The steel and coal strikes, however, completely halted pipe deliveries and caused a shut down on some sections of the work. Insofar as weather conditions were concerned, the worst was to come after the first of the year. In fact, the heavy rainfall, which in some areas amounted to floods, virtually

Telephone cable attached to pipe for underwater crossing of Red River near Shreveport.



PHOTOGRAPHS BY J. E. HAMPSON

Ditcher at work in hilly section near Prescott, Arkansas.

amounted to a winter-long shut down. Favorable weather conditions did not return until early in April, and, of course, the original plan of helping to supply the peak winter gas demand with the new line never materialized.

The sole bright spot in the entire construction procedure was the fact that three river crossings were installed ahead of the bad weather. The crossings are of the Red River, Little Missouri, and Ouachita. All were dual lines laid of 14-in. pipe to assure against service interruption in event of line breakage.

The major river crossing was that of the Red River where two lines each 2280 ft in length were laid. Blasting, dredging, and dragline operations were required on this crossing, the lines being buried 10 ft below the lowest point of the river bed. The west bank was cut back more than 900 ft to protect the pipe from future erosion. A smaller cut was made on the east bank. In all, 200,000 cu yd of dry dirt and 120,000 cu yd of wet dirt had to be removed. The levee on the west bank of the river was relocated and built up and new loops laid around the area of the crossing.

Assembled on shore, the pipe was given a protective coating, after which 1000-lb river clamps were attached, and slats fastened to the pipe as a means of protecting the coating when placing the pipe in the river. With the pipe supported by pontoons, side-boom tractors and winch trucks were employed to push the line across. So that the location of the pipe could be determined after it was lowered to the bed of the river, small floats were attached to it.

Dredges excavated the river bed beneath the pipe to lower it to the proper

" Controlled Horizontal EARTH BORING

Above is a picture of a 26" Bore 77 feet long, completed in 3 hours' time.

"GOFER" GETS THE JOB DONE, WITHOUT TYING UP EXPENSIVE EQUIPMENT, OR COSTLY DELAYS ON THE SPREAD.

*For Information Write*

**GOFER BORING MACHINE CO.**

**BOX 102** **CLAYTON, MO.**

Emptying line at scraper trap after hydrostatic test.

grade, which, as mentioned, was 10 ft below the lowest point of the river bed. The two lines were laid 10 ft apart.

The Ouachita River crossing, 5 miles south of Arkadelphia, Arkansas also consisted of dual 14-in. lines and was installed in much the same manner as the Red River. The Little Missouri, 7 miles northeast of Prescott, Arkansas was a narrower crossing and a simplier one to lay. Dual 14-in. lines were installed here also.

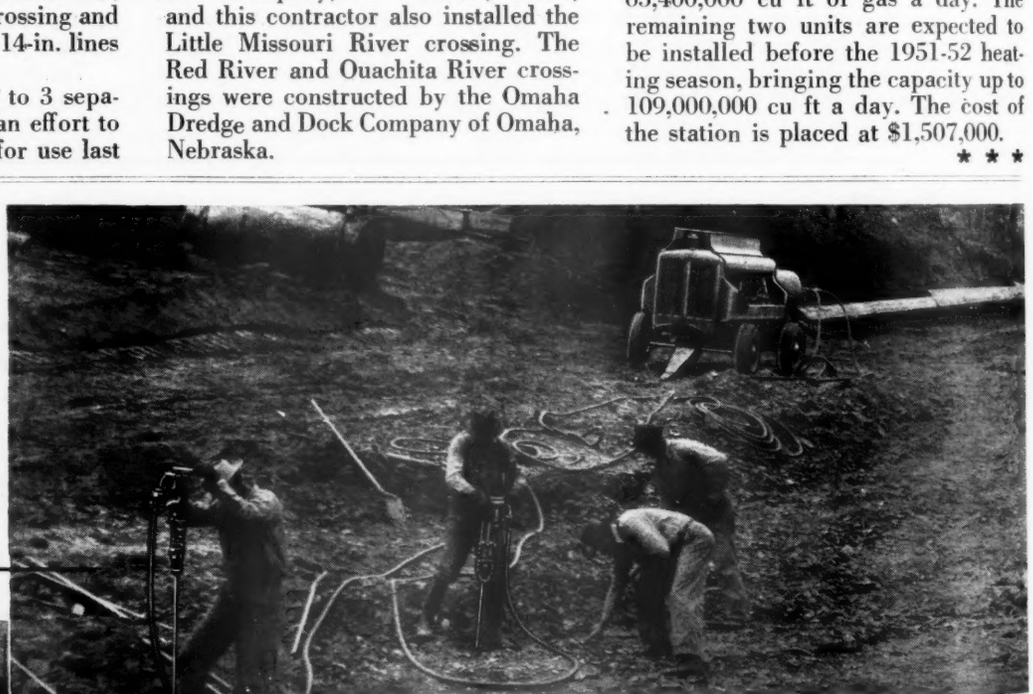
Contracts were awarded to 3 separate construction firms in an effort to complete the line in time for use last winter, and, if weather and other unforeseen conditions had not arisen, the plan would have been successful. Sections 1 and 2, between Waskom, Texas and Magnolia, Arkansas were laid by Anderson Brothers Construction Company of Houston, Texas. Sections 3 and 4, between Magnolia and Perla, were laid by Latex Construction Company, of Houston, Texas, and this contractor also installed the Little Missouri River crossing. The Red River and Ouachita River crossings were constructed by the Omaha Dredge and Dock Company of Omaha, Nebraska.

New right-of-way had to be cleared on sections 1 and 2 and some heavily timbered and swampy areas were encountered. Sections 3 and 4, however, closely parallel Arkansas Louisiana Gas Company's existing line and it was therefore necessary only to widen the right-of-way to make room for the new line. This, obviously, represented a great saving in time for the contractor. On the final 4000 ft, however, heavy going was experienced due to swamps.

To complete the new system, application was made to the Federal Power Commission for permission to build a 7000-hp compressor station at Blanchard, Louisiana. This permission was granted the latter part of July. Initially, three 1400-hp units will be installed, providing a total of 4200 hp. This will give a station capacity of 65,400,000 cu ft of gas a day. The remaining two units are expected to be installed before the 1951-52 heating season, bringing the capacity up to 109,000,000 cu ft a day. The cost of the station is placed at $1,507,000.

* * *


**250 ft. of air, instead of usual 210, holds full 90 lbs. pressure in 2 heavy rock drills instead of 70 lbs.; drills 35% more footage hourly**



**more air, to do faster work**

**JAEGER AIR PLUS COMPRESSORS**

Jaeger "new standard" ratings average 20% higher than other portable compressors — 125 ft. instead of 105 for pressure testing lines; 250 ft. instead of 210, 365 ft. instead of 315, 600 ft. instead of old 500 for faster drilling at full pressure with same men and tools.

**Portable "Sure Prime" Pumps for fast dewatering:** Small, easily moved, but pump big volume. See your Jaeger distributor or send for catalogs and prices.

**THE JAEGER MACHINE CO.** 662 Dublin Avenue Columbus 16, Ohio

# NEWS

## Sun Acquires Full Ownership of System

Sun Pipe Line Company (Texas) has acquired full ownership of the Sun-Yount Lee pipe line in East Texas by purchasing the outstanding one-third interest in the line held by the Stanolind Oil and Gas Company.

Purchase of Stanolind's interest in the 203-mile 10-in., 50,000-bbl-a-day capacity crude oil pipe line from the East Texas oil field near Longview, Texas, to Sun station on the Neches River near Beaumont was announced by William C. Kinsolving, president of Sun Pipe Line Company (Texas).

The Sun-Yount Lee pipe line property includes 146 miles of gathering lines, ranging in size from 2 to 8 in., and six main line pumping stations. The line was built in 1931 by Sun Pipe Line Company (Texas) and the Yount Lee Pipe Line Company.

Kinsolving also announced completion of a 2½-mile eastward extension of the line to make a connection with storage tanks of the Mid-Valley Pipeline Company whose 1000-mile crude line from Longview, Texas, to Lima, Ohio, is nearing completion.

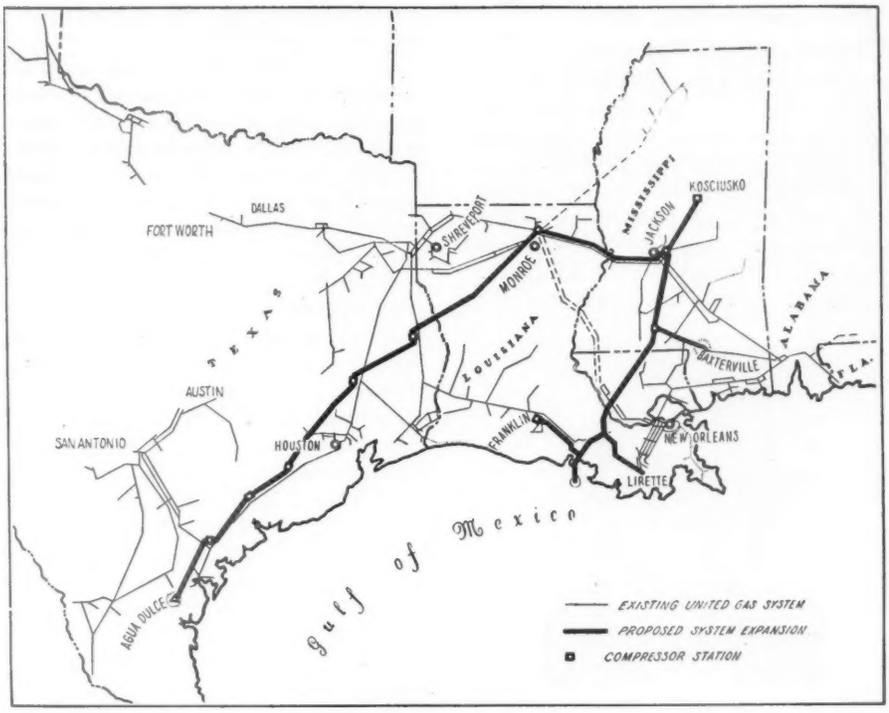
The Mid-Valley line is owned jointly by Sun Oil Company, of which Sun Pipe Line Company (Texas) is a subsidiary, and The Standard Oil Company (Ohio).

## Trojan New Member Pipe Line Contractors Association

Trojan Construction Company, Inc., recently was approved as a new member of the Pipe Line Contractors Association. Trojan has its headquarters at 2519½ South Robinson, Oklahoma City, Oklahoma, and has been engaged in general pipe line construction under its present organization since January, 1948.

Officials of the new member are as follows: Albert C. Johnson, president; Charles T. Tillotson, vice president; Maurice W. Crawford, vice president, and Felix M. Johnson, secretary-treasurer.

During 1948 the company did 130 miles of takeup and reconditioning work and laid 172 miles of pipe line. In 1949 the company took up and reconditioned 315 miles of pipe line and laid approximately 247 miles. So far during 1950 the company has contracts to lay 164 miles of pipe line and to put in six river crossings. At present Trojan is taking up 175 miles of 10-in. pipe line that Shell Pipe Line Corporation sold to a Corpus Christi, Texas, firm.




**United Gas Pipe Line Company, Shreveport, Louisiana, proposes to construct 1130 miles of natural gas pipe lines and appurtenant facilities in the states of Texas, Louisiana, and Mississippi, an expansion program estimated to cost in excess of $111,000,000. Application has been filed with the Federal Power Commission. The added facilities would provide an initial increase of 805,000,000 cu ft a day, an approximate increase of 33 1/3 per cent over the system's peak day delivery of 2,500,000,000 (billion) cu ft on December 15, 1949.**

# Merger of Five Gas Companies Proposed

United Natural Gas Company has applied to the Federal Power Commission for authorization to merge and consolidate with four other gas companies — Ridgway Natural Gas Company, St. Marys Natural Gas Company, Smethport Natural Gas Company, and Mercer County Gas Company.

The five companies, all wholly owned subsidiaries of National Fuel Gas Company, and all with main offices in Oil City, Pennsylvania, would form a new corporation, to be known as United Natural Gas Company.

United's application points out that many of the leases and gas lines of the five companies are in close proximity to each other and says that as a result of diminishing supplies in the northwestern Pennsylvania gas fields there is a growing dependence by the other four companies upon United for a supply of gas.

The general purpose of the proposed merger and consolidation, United said, is for more efficient and economical operation of the various properties and the continuation of satisfactory service to customers.

The application states that as of June 30, 1950, the physical property of the merging companies was carried on the books in the following amounts: United, $35,792,876; Ridgway, $2,227,924; St. Marys, $1,742,521; Smethport, $438,950; and Mercer, $53,727.

The authorized capital stock of the merged and consolidated corporation would be $29,308,000, divided into 1,172,320 shares of no par value but with a stated value of $25 each, the application states. Of this amount, 1,116,000 shares having a stated value of $27,900,000 would be issued, United Natural said.

United operates a pipeline system in Ohio and Pennsylvania, while the other four merging companies serve various communities in northwestern Pennsylvania.

## Rumsey Brothers Move Headquarters to Houston

Rumsey Brothers Pipe Line Construction Company has moved its headquarters from Wichita, Kansas, to Houston, Texas. New offices are in the M. and M. Building at the latter place; the telephone number is PReston 0423.

## New Contracting Firm Organized at Houston

Williams Brothers-Davis Company is the name of a new pipe line contracting firm having its headquarters at 6006 Humble Road (also known as Jensen Drive), Houston, Texas. The new company purchased the office building and warehouse of Williams Brothers Corporation of Tulsa, Oklahoma, at that address. Officers are:

H. L. Davis

H. L. Davis, president; Wilbur J. Holleman, vice president; Mary J. Hailey, secretary, and E. G. Thiel, treasurer.

The company has got off to a good start since its organization, having laid approximately 60 miles of 4-in. line for Pan American Refining Corporation between Texas City and Sweeny, and is presently engaged in laying approximately 85 miles of 30-in. for Transcontinental Gas Pipe Line Corporation from El Campo, Texas, to a point north of Humble.

## Shell Personnel to Venezuelan Project

Shell Pipe Line Corporation will assist Shell Caribbean Pertoleum Company in designing and constructing a 30-in. 162-mile crude oil pipe line to be built in Venezuela. The projected line will move crude oil from the Maracaibo district to the Paraguana Peninsula, and will be featured by long marine crossings of Lake Maracaibo and the Gulf of Corro.

D. F. Sears, assistant to president, has been placed in charge of the Venezuelan project with headquarters in Houston.

W. H. Shelley will be project superintendent with headquarters at Maracaibo. Mrs. Harriett Harman, secretary to T. E. Swigart, Shell president, will move to Maracaibo as secretary to Shelley.

G. G. Billings will be assigned to the project and at the outset will assist with certain economic studies, which will require him also to make his headquarters at Maracaibo. Billings will be assisted in these studies by C. K. Monroe. J. B. Churchwell will serve as reconnaissance engineer on the routing of the new line.

Various transfers of other personnel are being made on account of these transfers. All transfers, other than that of Terrill, will be considered temporary; however, should the project proceed as expected, they will stand, subject to further changes as the project is completed.

A. F. Terrill will become area superintendent-West Texas.

Mrs. Jeanne Cartwright, who was formerly secretary to Dr. Roy H. Morse of Shell Oil Company, will become secretary to T. E. Swigart.

Becoming acting assistant area superintendent will be J. K. Alfred in West Texas; R. V. Lahr in the Mid-Continent; and D. M. Farrell in the Texas-Gulf.

L. F. Mason as acting assistant manager-personnel and industrial relations will assist L. C. Geiler. R. L. Carruthers as supervisor—safety and training will move to head office and assist Geiler and Mason in directing the safety and training programs.

H. D. Solsbery as training representative-Mid-Continent will take over the duties handled by Carruthers at Cushing. E. M. McCracken moves to Cushing as safety engineer-Mid-Continent area.

## First Illinois Member Contractors Association

First member of the Pipe Line Contractors Association with headquarters in the State of Illinois is L. R. Young Construction Company. The company maintains its headquarters at 1058 West Main Street, Olney, Illinois, and has a branch office at 4100 Gravois, St. Louis, Missouri. In addition to pipe line construction the firm is also engaged in a general construction and trucking business.

President of the new member is V. T. McMahon; L. R. Young is vice president and general manager. T. E. Costello is the secretary-treasurer.

## How to Start a Cold Diesel Engine

Where temperatures are low in buildings or out-of-doors, difficulty is often experienced in starting diesel engines. The reason, of course, is the absence of electric or other spark for igniting the charge. The diesel engine is dependent on the temperature resulting from compression. Obviously, therefore, if the engine cylinder is cold it will absorb much of the heat from the compressed gas.

To ignite diesel fuel oil the temperature must be as high as 800 to 1000 F. The compression corresponding with these temperatures varies from 350 to 500 psi. All these things are more or less variable depending upon the kind of fuel, the original temperature of the fuel and air, the type of injector or atomizer, etc.

Present day diesels are equipped with mechanical starters; however, even mechanical starters sometimes have trouble and fail to start the diesel when weather is extremely cold. Under such conditions, if steam is available, an excellent aid to starting is to warm up the diesel cylinders by blowing steam into the water jackets and by preheating the fuel. Or, use a blast of hot air, or even hot water. Warmed-up cylinders will cause them to absorb less heat from the compressed gas and starting will be made decidedly easier.

W. F. S.

## Ruined Ball Bearings Can Be Repaired

The writer finds that many users of ball bearings are unaware of the fact that ruined ball bearings can often be repaired. For example, a letter was received not long ago in which it was stated that "the keeper of the balls" went to pieces. The letter stated that the bearing was a rather large one costing about $30 and the question was asked, "Can it be reconditioned?"

Yes. This writer did not see the ruined bearing, but its repair sounds simple as it appears that only the retainer needs replacing, which is not difficult for a specialist in ball bearing repairs. For some reason or other unknown to the writer very little has been said in our publications about the fact that ball bearings can be rebuilt. Balls are replaced with new ones; rings are reground, or replaced if necessary, etc. Here is an economy that is often well worth while. W. F. S.

## Accident Award to Shell Pipe Line Corp.

The 1950 Accident Prevention Award has been presented to Shell Pipe Line Corporation in recognition of support given to a "Stop Accidents" campaign by the *Go-Devil*, monthly house magazine published by the company. The award is sponsored by the National Safety Council and the Advertising Council, Inc., New York.

For the last year, the *Go-Devil* has devoted one or more pages in each issue to safety subjects. These have included accident box-scores, tips on safe working and driving practices, stories about safety records of various company departments, and safety advertising. Guy F. Fausset, Jr., is editor of the publication.

The magazine is credited with helping Shell Pipe Line achieve the lowest disabling injury rate among all oil and gas pipe line companies last year.

## Ceremonies Mark Start Texas Illinois Gas Line

Laying of the main 30-in. high pressure natural gas pipe line that will join the Chicago area with the Texas Gulf Coast area was begun August 29 when big new pipelaying machines cut a deep trench through the stubble of a Texas hay field.

The ground-breaking near Wharton was witnessed by a group of Texas and Illinois business and civic leaders. It was the signal for work crews at other locations along the right-of-way north of here to begin laying the large diameter steel pipe for the $120,000,000 project.

Texas Illinois Natural Gas Pipeline Company, an affiliate of The Peoples Gas Light and Coke Company, of Chicago, has put construction crews numbering more than 2000 men in the field to assure completion of the new pipe line by late 1951.

This will be the third major high pressure natural gas pipe line serving the Chicago metropolitan region and other urban communities in a five state area — Illinois, Indiana, Iowa, Kansas, and Nebraska.

When completed, the line will have an initial capacity of 305,000,000 cu ft of natural gas a day. Construction of additional compressor stations along the route will eventually raise this figure to over 500,000,000 cu ft daily, matching the present capacity of the dual lines of Natural Gas Pipeline Company of America, also a Peoples Gas affiliate, which extend into the Chicago area from the Texas Panhandle and western Oklahoma fields.

Terminal points of the new pipe line will be at Joliet and Volo, Illinois.

Stretching more than 1330 miles from the rich gas producing area of south Texas to the Chicago market area, the main portion of the new pipe line will consist of 30-in. electric-welded pipe laid in 40-ft lengths. Lateral lines bringing the gas from several fields converge near Wharton to join the main transmission line.

Representatives of Chicago and Houston, with businessmen from those cities and officers of the two companies, joined in today's ceremony as work signals were flashed along the line to construction crews by field radio telephone.

Those who joined in the ceremony where the first 4-ft wide trench was dug included Oscar Hewitt, commissioner of public works of Chicago; General E. O. Thompson, member of the Texas Railroad Commission; James F. Oates, Jr., chairman of Peoples Gas and board chairman of the Texas Illinois company; Joseph J. Hedrick, president of Texas Illinois, and Mark V. Burlingame and Clayton Holmes, vice presidents of the pipe line company. Hedrick presided at the brief ceremony.

Following the ground-breaking, a barbecue luncheon was served to several hundred persons who had gathered at the site. It was served from a motorized version of the traditional cowboy chuckwagon.

In addition to watching the ditching machine cut the 6-ft deep trench the visitors observed the bending of a section of steel pipe that will become part of the line.

(See Pictorial Section this issue.)

## Map of Natural Gas Lines Issued

Alec Crowell, natural gas consultant, Carondelet Building, New Orleans, Louisiana, has just issued a map showing natural gas pipe lines in the United States. The map is very complete, giving in addition to operating lines, those under construction, approved, and proposed. The maps are being made available to interested parties at a moderate charge.

## Transco Operating Personnel Named

Transcontinental Gas Pipe Line Corporation, through President Claude A. Williams, announces the appointment of two key operating men and one change in personnel.

Walter H. Davidson, superintendent of construction for Transcontinental, becomes general superintendent of the Texas to New York City line. A Texas A. and M. graduate and formerly associated with Natural Gas Pipeline Company of America, Davidson has had a leading part in the construction of Transcontinental, now nearing completion.

Raymond Crowe became chief engineer, effective September 1. Crowe resigned from Stone and Webster, independent engineers on Transcontinental construction, in which capacity he had been assigned to construction of this line.

Crowe is a graduate of Oklahoma A. and M., a registered professional engineer, and an experienced pipe line builder and operator. Before joining Stone and Webster in February, 1949, he had been with Stanolind Pipe Line Company for 16 years.

F. B. (Duck) Haverfield has been named superintendent of compressor stations. Haverfield recently resigned from Continental Oil Company, where he was manager of the gas and gasoline division. He had been with Continental Oil 23 years, during which time he was engaged both in construction and operation of gas and gasoline facilities.


PIPE LINE CONTRACTORS

Experienced in
New Construction
Reconditioning
Taking Up Old Lines

*31 Years of Pipe Line Experience*

A. C. HOLDER CONSTRUCTION CO.

TULSA, OKLAHOMA
2615 East Admiral Place
Phone 98961

REPAIR LEAKS
QUICKLY—PERMANENTLY

SKINNER-SEAL PIPE JOINT CLAMPS stop leaks at joints. Put on under pressure—without interruption of service. Quick, simple, lasting repair. Sizes 1/2" to 24" incl. in stock.

SKINNER-SEAL COLLAR LEAK CLAMP—designed to stop every type of collar leak in oil and gas lines. Sizes: 2" to 13" inclusive.

M. B. SKINNER COMPANY
SOUTH BEND 21, INDIANA, U. S. A.

# - PIPELINE PERSONALS -

**Ewell F. Hindman** has been appointed general manager of the Louisiana Natural Gas Corporation. Hindman is a veteran of many years

Ewell F. Hindman

experience in the natural gas industry. For 20 years he was associated with Arkansas-Louisiana Gas Company in various capacities in luding operations, gas measurement, and leakage engineering.

A native of Camden, Arkansas, Hindman joined Louisiana Natural in 1949 as pipe line superintendent and continued in that capacity until his promotion to general manager. He is now a resident of Lake Charles, Louisiana.

**Samuel H. Elliott,** general manager of the transportation department of The Standard Oil Company, Ohio, has been made general sales manager of the company.

Elliott has spent his entire business life with the company since his graduation from Harvard School of Business Administration in 1929. He was elected a vice president of Sohio in 1946 and a director of the company in 1949, and will continue in these capacities.

Simultaneously, announcement was made of the appointment of **Charles E. Spahr,** who has been assistant to Elliott for several years, to become manager of the transportation department.

Elliott was born in Lawrence, Kansas, in December, 1901, and was graduated with a degree of Civil Engineer in 1924 from the University of Kansas. For three years thereafter, he designed and built bridges in Kansas and New Mexico, and in 1929 was graduated from Harvard.

He immediately joined Sohio, and was active in business research in the development of product merchandising. He served thereafter for four years as purchasing agent for Sohio and, when the company began the active expansion of its pipe lines, he was named manager of the pipe line department, and later manager of all transportation operations for Sohio.

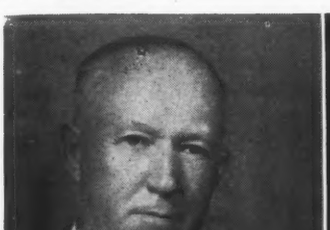
Spahr has been with Sohio for 11 years, including a period of four years in the U. S. Army, during which he was a key figure in building the India-China pipe line. He was the major in charge of construction of the 570-mile Chittagong-Tinsukia section of the emergency fuel pipe line which was built to supply gasoline for the long-range bombers.

**F. J. McElhatton,** head of the communications and cathodic protection departments of Panhandle Eastern Pipe Line Company, Kansas City, Missouri, has been made assistant superintendent of the transmission compressor department. He will work under **George T. Koch,** department superintendent. McElhatton will continue as head of communications, and cathodic protection work will be under the supervision of **D. K. Stephens,** superintendent of the transmission pipe line department.

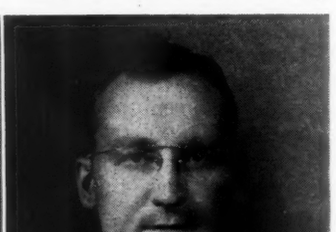
**William M. Dougherty** has been transferred from the engineering department to the personnel department in the Kansas City office of Panhandle Eastern Pipe Line Company. He succeeds **Fred J. Frey,** who has been made chief clerk in the purchasing department.

**Roy Smith,** Tulsa County assessor and Democratic nominee for the post in the November general election, recently announced his resignation to join the Service Pipe Line Company as a tax representative. Smith joined the company September 1. Smith was elected county assessor in 1948 and won renomination in the democratic primaries this year. He has served in the Tulsa County assessor's office since January 1, 1929.

Born in Stillwater, Oklahoma, Smith moved to Tulsa in 1918. His first job was with the Thomas Hardware Company. He was employed there until he joined the Osage Torpedo Company. Dan Rowe was elected county assessor in 1926, and Smith joined his staff January 1, 1929. He remained in the county assessor's office under Rowe until he was elected county assessor.



L. L. Armstrong

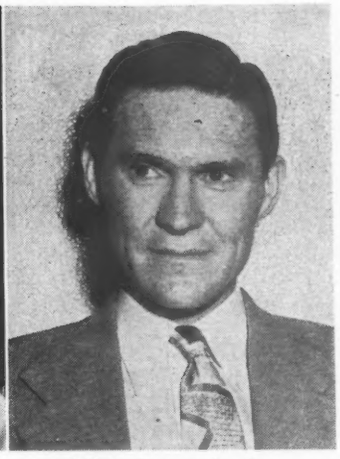


Robert J. Dunbar

**L. L. Armstrong** has been appointed chief engineer of the Commonwealth Natural Gas Corporation, Richmond, Virginia, it is announced by Erick Larson, president. Prior to his appointment, Armstrong was connected with the Tennessee Gas Transmission Corporation at its main office in Houston, Texas. A veteran of 30 years' experience in all phases of the natural gas industry, Armstrong has served in Nebraska, Kansas, Oklahoma, and Texas in various positions connected with the construction and operation of pipe lines. He originally started out in the pipe line and production department of the Cities Service Company. In 1930, he became associated with the Northern Natural Gas Company in Omaha. Later he served for a period of time with the Federal Power Commission and, subsequently, in 1946, joined the Tennessee Gas Transmission Corporation where he served in various capacities, among which was his position as pipe line superintendent of the Big and Little Inch oil lines when conversion was first made from oil to natural gas.

At the same time, Larson announced the selection of **Robert J. Dunbar** as assistant chief engineer. Dunbar was formerly associated with the Pittsburgh-West Virginia Gas Company, where for 13 years he engaged in production, transmission, and gas measurement work. He attended Salem College and the New Mexico School of Mines. Upon leaving the college, he became associated with the Hope Natural Gas Company and, subsequently, the Geophysical Company, Inc. He has been active in the Appalachian Gas Measurement Short Course and West Virginia University extension courses in petroleum and natural gas.

L. E. Anderson



W. L. Kennedy, Jr.

Roy J. Tibbets

William H. Morris

**W. L. Kennedy, Jr.,** has been promoted from hydraulic engineer in the engineering department, to planning engineer in the planning and economics department, and **L. E. Anderson** from engineer to hydraulic engineer, it has been announced by **J. R. Polston,** general manager of the Service Pipe Line Company.

Kennedy will be under the supervision of **T. R. Aude,** manager of planning and economics and director of the company. Anderson will remain under the supervision of **A. H. Newberg,** chief engineer.

Kennedy has been with Service Pipe Line Company since 1946, during which time he spent one year in the pipe line department of Standard Oil Company (Indiana) in Chicago.

He is a 1943 graduate of Oklahoma University in chemical engineering and served as a deck officer in the Navy during the war.

Anderson joined the company September 1, 1947, as a junior engineer, then was promoted to engineer. He was graduated in 1946 from the University of Nebraska, Lincoln, Nebraska, receiving a B.S. degree in civil engineering.

He holds the rating of second lieutenant in the 808th Engineer Petroleum Distribution Company, an Army reserve unit sponsored by the Service Pipe Line Company.

**Bill Hall,** compressor station superintendent at Lobelville, Tennessee, for Tennessee Gas Transmission Company, has been transferred to Batesville, Mississippi, to fill a vacancy created by the resignation of **J. D. White. Audis Brown,** assistant superintendent, moves up as superintendent at Lobelville, and **Jack Leeper,** chief plant repairman, becomes assistant superintendent. **Brown Dailey** was promoted from plant repairman to chief plant repairman.

**Roy J. Tibbets** has been appointed vice president in charge of all pipe lines and a member of the board of directors of Sinclair Refining Company. A veteran of more than 30 years' service in the pipe line operations of the company, Tibbets succeeds **W. W. Baker,** who has retired.

**William H. Morris** is to be vice president and general manager of crude pipe line operations, for Sinclair, and **Lewis B. Moon** will be general manager of products lines. Morris and Moon have for many years held important positions in the company's pipe line department, which now operates 10,800 miles of crude lines and 2800 miles of product lines.

**N. W. Freeman,** formerly assistant to the president; **R. L. McVey,** formerly controller; **Harold Burrow,** formerly manager of the gas supply department, and **Louis Sonnen,** formerly manager of the purchasing department, have all been made vice presidents of Tennessee Gas Transmission Company, Houston, Texas.

**J. B. Jarman,** cost engineer, has been promoted to superintendent of materials in the operating department, and **G. V. Rohleder** has been moved up from junior engineer to replace Jarman as cost engineer in the engineering department of the Service Pipe Line Company.

Jarman will report to **C. W. Butler,** operating superintendent, and Rohleder to **A. H. Newberg,** chief engineer of the company.

Jarman received a degree in civil engineering at Oklahoma University in 1927 and has been with Service Pipe Line Company since that time. He had served in a number of positions in various parts of the company's 10-stage system, and had been cost engineer since 1948.

Rohleder joined the company at Hays, Kansas, as a pipeliner in 1942. Serving as an infantry first lieutenant during World War II, he received the purple heart for wounds received in the 1944 Normandy invasion. Leaving service in November, 1945, he completed studies for his bachelor of science degree in business and engineering administration at the Massachusetts Institute of Technology and returned to the company as a junior engineer in July, 1948.

**W. N. Stivers,** Casper, district superintendent in Service Pipe Line Company's Wyoming division, has been transferred and promoted to the position of assistant division manager, Oklahoma division.

Stivers will be in charge of the company's northern Oklahoma districts and will have his headquarters at Shawnee. He replaces **H. C. Jones,** who was assigned to be in charge of southern Oklahoma districts. Both Stivers and Jones report to **J. E. Polston,** Oklahoma division manager.

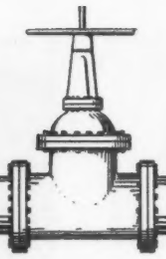
**S. L. Cox,** Casper, area engineer for the company's Wyoming and Nebraska divisions, was promoted to district superintendent, replacing Stivers. **C. F. Gearhart,** Tulsa, was promoted from senior engineer to area engineer to replace Cox at Casper. Cox and Gearhart report to **R. R. Strand,** Wyoming division manager.

Two other transfers also were announced.

**F. M. Willenburg,** Shawnee, Oklahoma, assistant division manager in charge of southern Oklahoma districts, was transferred to Fort Worth as assistant division manager, Central and East Texas division, reporting to **J. J. Hill,** division manager.

**Ellis Orr,** Carrollton, Missouri, industrial relations supervisor, Illinois and Missouri divisions, was transferred to Drumright, Oklahoma, as assistant to **J. E. Laughorn,** district superintendent.

# PIPE LINE PROJECTS



## Wyoming-Wood River 1080-Mile Oil Line Announced

Plans have been completed for construction of a 1080-mile crude oil pipe line, extending from a point near Worland, Wyoming, to the Wood River refinery area in Illinois. The Platte Pipe Line Company has been formed to build and operate the line.

Present participants in the project are The British-American Oil Company, Ltd., Continental Oil Company, The Ohio Oil Company, The Pure Oil Company, and Sinclair Refining Company. Estimated cost of the project is $60,000,000, which will be financed by the participating companies and by a loan arranged with the Metropolitan Life Insurance Company.

Completion of this line, which will be a common carrier, will afford a greatly increased outlet for all producers in the Rocky Mountain areas seeking additional markets. Rocky Mountain crude oil reserves, according to a recent engineering survey, amount to 1,690,000,000 bbl. These great reserves will now become available at low transportation cost to several of the largest refining and consuming areas in the country. Increased crude oil, exploration, development, and production in the western area will be encouraged, and upon completion of the new line it is estimated that there will be a market above Rocky Mountain refinery requirements for about 90,000 bbl of oil daily.

All participating companies are large operators in the Rocky Mountain area. British-American is an important producer in Wyoming and neighboring states. Continental, which is celebrating its 75th anniversary this year, was a pioneer in developing Wyoming production. Another pioneer, The Ohio Oil Company, is credited with the second largest reserves in the state. Pure has producing operations in the Worland and West Poison Spider fields. Sinclair has been active in Wyoming for 30 years and operates its largest refinery. All companies having Rocky Mountain refineries have declared their policy to be to refine in that area all that the market will absorb. The new pipe line will carry the excess of crude oil to refineries in larger consuming territory.

The Platte line fits into and supplements plans initiated since the Korean incident arose to increase available crude oil resources by drawing upon West Texas, the Rocky Mountain area and, if necessary, upon Canada. Need for increased outlets for Rocky Mountain crude even under normal conditions was forecast as long ago as 1947 by the Pipe Line Transportation Committee of the National Petroleum Council, which reported that the increase of consumption called for expansion of pipe line facilities such as now planned.

The new line will consist of 140 miles of 16-in. pipe from Worland to Casper, Wyoming, and 940 miles of 20-in. pipe from Casper to the Wood River area, and will be so routed that practically all pipe lines in Wyoming can be connected to this line. It crosses and can be connected with nearly all major pipe line systems in the middle west. The Ohio Oil Company's pipe line system covering the Big Horn Basin area will be connected into the new 16-in. line at Worland. The Sinclair lines from the Wertz, Lost Soldier, and Sand Draw fields and from the Salt Creek field will connect with the main line system at Casper.

Due to the elevation of the main line station at Casper, which is slightly more than 5000 ft above sea level, only two pump stations will be necessary to provide the line with a delivery capacity in excess of 70,000 bbl to Wood River—approximately 4500 ft lower than Casper. When conditions warrant, provision has been made whereby, with the installation of additional pump stations, the line's delivery capacity will be increased to about 150,000 bbl daily.

From Casper, Wyoming, the line will traverse the eastern part of the State of Wyoming in a southeasterly direction through Nebraska, passing within a few miles of the newly-discovered fields in the Sidney, Nebraska, area, across the northeastern corner of Kansas, making juncture with the present Sinclair lines at a point northeast of Carrollton, Missouri. At Wood River it will connect with the trunk line system of The Ohio Oil Company extending from Wood River to the Ohio-Pennsylvania state line.

It is anticipated that the first shipment of pipe will be made in February, 1951, and construction of the line will be completed in the fall of 1951.

Chief executives of the five participating oil companies met in Casper at the offices of The Ohio Oil Company, August 29, to complete plans for the 1080-mile pipe line. The oil company presidents attending the meeting were: L. F. McCollum, Continental Oil Company; J. C. Donnell II, The Ohio Oil Company; L. S. Wescoat, The Pure Oil Company, and P. C. Spencer, Sinclair Refining Company. W. K. Whiteford, The British-American Oil Company, Ltd., was unable to attend because of a storm between Toronto and Chicago, and was represented by C. D. Miller, executive vice president. H. L. Phillips, president of Sinclair Oil and Gas Company, is president of the Platte Pipe Line Company, which will build the new line.

## Compressor Stations Authorized Temporarily

The Federal Power Commission, finding that an emergency situation exists, has granted temporary authorization to Mississippi River Fuel Corporation, of St. Louis, Missouri, to construct four new compressor stations and to operate three others already built in order to increase the sales capacity of its natural gas transmission system. The temporary authorization will expire not later than February 2, 1952.

The commission's action was issued as a supplement to its opinion and order of July 28, which authorized in part Mississippi's proposed expansion program but reopened the proceeding with respect to the company's natural gas supply. The July 28 order authorized Mississippi to increase the capacity of its system from 266,000,000 cu ft a day to 300,000,000 cu ft a day.

The July 28 order rejected Mississippi's plan to lease the seven compressor stations, three of which had already been built, from Stupp Brothers Bridge and Iron Company. The FPC said that the reopening of the proceeding would afford Mississippi an opportunity to amend its application and seek authority to acquire or construct, finance, and operate the stations instead of leasing them.

# LONG TERM PIPE LINE PROTECTION WITH NO-OX-ID

NO-OX-ID rust preventives provide positive pipe line protection for periods of long duration. Case histories testify to this fact. Pipe lines that received NO-OX-ID protection years ago have been uncovered and found to be in the same perfect condition as the day they were laid. You can receive the additional advantages of NO-OX-ID rust preventives at a cost that is no more than you would pay for pipe line protection with other materials.

NO-OX-ID and NO-OX-IDized Wrappers are available to meet any pipe line requirement—for application by stationary machines, Traveliners or by hand. When planning your next pipe line job, consult with your Dearborn engineer. He will assist you in the selection of the correct NO-OX-ID and the best methods of application to meet your needs.

**DEARBORN CHEMICAL COMPANY**

*General Offices:* 310 South Michigan Avenue • Chicago 4, Illinois

**WRITE FOR THIS VALUABLE BOOKLET**

*"Piping Hot" is an interesting and completely illustrated story about a major pipe line installation made under adverse conditions. Mail the coupon for your copy.*

DEARBORN CHEMICAL COMPANY
310 S. Michigan Ave., Dept. PE
Chicago 4, Illinois

Gentlemen: Please send me a copy of your booklet "Piping Hot."

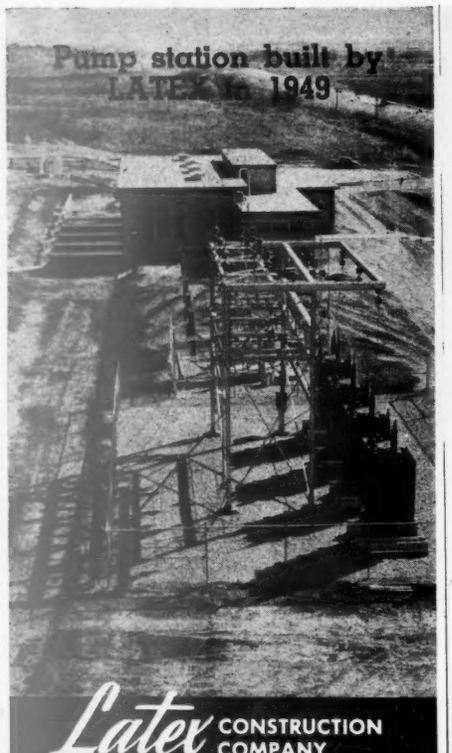
*Name*.....

*Company*.....

*Address*.....

*City*.....*State*.....

Dearborn
Reg. U. S. Pat. Off.
THE ORIGINAL RUST PREVENTIVE
NO – OX – ID
IRON + = RUST




Latex CONSTRUCTION COMPANY
General Contractors
Oil·Gas·Gasoline·Water Pipelines
HOUSTON, TEXAS ATLANTA, GA.
L. H. Favrot — G. A. Peterkin —
J. W. Sharman — R. P. Gregory

GENERAL
PIPE LINE
CONTRACTORS
Personal Supervision on
Construction of Your
Pipe Lines • Water Lines
Sewer Lines • Excavations
Salt Water Disposals
TROJAN
CONSTRUCTION CO.
INCORPORATED
OKLAHOMA CITY, OKLA.
BOX 4427 · PHONE 2-7696
WAREHOUSE PHONE 6-1430

# PROJECTS

## Line to Georgia and Florida Proposed

South Georgia Natural Gas Company, of Atlanta, Georgia, has filed an amended application with the Federal Power Commission proposing to construct and operate a pipe line system to supply natural gas to markets in Georgia and Florida.

At the same time the company asked the FPC to order either Southern Natural Gas Company or Transcontinental Gas Pipe Line Corporation, or both, to supply natural gas for the project.

South Georgia proposes to build a 526.9-mile pipe line system extending from a connection with Southern Natural's system in northern Georgia and running into Florida. If the proposed system is connected with Transcontinental's line, the application says, the construction of an additional 53 miles of line will be required.

Estimated cost of the proposed facilities is $10,500,000, if all of South Georgia's requirements are supplied by Southern Natural and $12,080,000 if Transcontinental supplies the gas.

Designed capacity of the proposed system is 45,000,000 cu ft of gas per day, with the third year peak day requirements for firm sales estimated at 36,697,000 cu ft. The application says that there is now no natural gas available to any of the communities proposed to be served.

The application says that additional studies are being conducted into the feasibility of constructing additional lines into other areas of southwest Georgia and southeast Alabama.

In its original application, filed with FPC last March 28, South Georgia proposed to build about 248 miles of line to serve distributors in southern Georgia only.

## New Colorado Gas Line To Tap Isolated Field

A new pipe line project that will tap an isolated shut-in natural gas field in a remote corner of Colorado to supply fuel to Colorado River Valley cities has been announced by the General Petroleum Corporation at its Los Angeles headquarters.

A new company, the Grand Valley Pipeline Company, will be formed by General Petroleum, M. B. Garman, and Public Service Company of Colorado, to build and operate the new line, according to General Petroleum's executive vice president, P. S. Magruder.

Magruder explained that each of the three parties will have a one-third interest in the line, which will bring natural gas from the Piceance Creek gas field to communities along the Colorado River including Grand Junction, Colorado. Grand Junction, a city of 14,000, has not previously had access to natural gas supplies.

Magruder will serve as president of the new pipe line company. Garman will serve as vice president and secretary, while F. T. Parks, vice president in charge of gas operations for Public Service, will be vice president and treasurer.

An initial plan for the pipe line route calls for it to generally follow the existing highways that link Rio Blanco, a town near the gas field, with Rifle and Grand Junction. Between Rifle and Grand Junction the highway generally parallels the Colorado River.

Contracts have been signed, said Magruder, providing for the sale of General Petroleum's natural gas to the new pipe line company and for the sale of the gas by the pipe line company to Public Service Company of Colorado for distribution on a retail basis to Grand Junction homes and industries and to other towns along the route.

## FPC Approves Construction Of Connecting Pipe Line

The Federal Power Commission has granted temporary authorization to New York State Natural Gas Corporation, of New York City, and The East Ohio Gas Company, of Cleveland, Ohio, for the construction of connecting pipe lines in Pennsylvania and Ohio, which would make additional natural gas available to East Ohio during the winter months.

New York State Natural will build a 62-mile, 20-in. line in Pennsylvania, and East Ohio will construct a 1-mile, 20-in. line in Ohio. Estimated cost of the construction is $3,792,806 for New York State Natural and $40,940 for East Ohio. The two companies are affiliates in the Consolidated Natural Gas Company system.

New York State Natural estimates that it will have available for sale to East Ohio during the next three years approximately 40,000,000 cu ft of gas per day during the winter months of January, February, and March, with peak day deliveries going as high as 87,000,000 cu ft. The aggregate winter delivery for each year will be approximately 3,600,000,000 cu ft, New York Natural said.

The FPC conditioned the temporary authorization upon the filing by New York State Natural within 30 days of a satisfactory rate schedule and service agreement for the proposed service.

## Indiana Company Would Convert to Natural Gas

Northern Indiana Fuel and Light Company, of Auburn, Indiana, has asked the Federal Power Commission for authorization to build a 31-mile, 8⅝-in. line, which would carry natural gas to communities in northeastern Indiana.

The application also asks the FPC to direct Panhandle Eastern Pipe Line Company to connect its facilities with those proposed to be built by Northern Indiana and to supply natural gas for the project. Northern Indiana estimates its maximum daily demand at 500,000 cu ft during the winter of 1950-51. Northern Indiana now manufactures and distributes artificial gas.

## Examiner Grants Kansas Nebraska Expansion Request

An initial decision has been filed by Federal Power Commission Presiding Examiner Marvin Farrington authorizing Kansas - Nebraska Natural Gas Company, of Phillipsburg, Kansas, to expand the capacity of its pipeline system in Kansas and Nebraska to approximately 146,000,000 cu ft of natural gas a day.

The examiner's decision is subject to review by the commission, either upon appeal by parties to the proceeding within 20 days or upon the FPC's own motion within 10 days thereafter.

The construction program includes installation of 1640 hp of additional capacity at existing compressor stations in Kansas and Nebraska; 16 miles of 12¾-in. line to replace 8⅝-in. line in Kansas; approximately 6 miles of 12¾-in. pipe to loop an existing 12¾-in. line; 22 miles of 8⅝-in. pipe to replace 6⅝-in. and 4½-in. pipe in Nebraska; 6 miles of 8⅝-in. and 2.6 miles of 6⅝-in. line to replace 4½-in. pipe in Kansas; and approximately 4 miles of 2⅜-in. pipe in Nebraska.

## Intermediate Decision Ordered Omitted

The Federal Power Commission has ordered the intermediate decision procedure omitted in the proceeding involving two requests for FPC orders directing Panhandle Eastern Pipe Line Company, of Kansas City, Missouri, to supply natural gas for deliveries to the southeastern Michigan area.

The case now goes directly to the commission for final decision without the filing of an intermediate decision by the Presiding Examiner.

One of the requests, by three Michigan cities — Port Huron, Marysville, and St. Clair—is for the Commission to order Panhandle to establish a connection for the sale of natural gas to The Detroit Edison Company, which now distributes manufactured gas to the three municipalities. In the other case, Southeastern Michigan Gas Company is seeking FPC authorization for the construction of a 55-mile pipe line, which would bring natural gas to the area in Macomb and St. Clair counties, Michigan, and has asked the commission to order Panhandle to supply gas for the proposed project.

## Proposes Alabama Mississippi Service

Southern Natural Gas Company, of Birmingham, Alabama, has asked the Federal Power Commission to authorize the construction of line taps and metering facilities for the sale of natural gas to communities and natural gas districts in Alabama and Mississippi.

The natural gas would be sold at delivery points adjacent to Southern Natural's system to the purchasers, who will construct lateral lines to transport the gas to various communities for distribution.

The proposed purchasers are North Central Natural Gas District, Deer Creek Natural Gas District, Carthage Natural Gas District, and the towns of Ethel, McCool, and Weir, all in Mississippi; and the towns of Aliceville and Carrollton, in Alabama.

Southern Natural estimates the total annual requirements of the purchasers at 572,405,000 cu ft.

## Seek Permit For Compressor Units

Michigan Gas Storage Company, of Jackson, Michigan, has applied to the Federal Power Commission for authority to install two 2200-hp compressor units at an existing compressor station on its natural gas transmission system in Michigan.

Michigan Gas said the additional units would enable it to pump from its storage fields the additional volumes of gas required to supply Consumers Power Company, also of Jackson, on peak days during the coming winter. Consumers' peak day requirements during the 1950-51 winter are estimated at 250,000,000 cu ft of natural gas a day, of which Michigan Gas must be prepared to supply 233,000,000 cu ft, the application says.

Consumers' actual peak day requirements during the winter of 1949-50 were 145,418,000 cu ft of natural gas. The application says that an "emergency" has now arisen because of the abrupt and acute increase in Consumers' gas requirements created by an unprecedented demand for gas for space heating.

## Crude Oil Line to West Coast Planned

The West Coast Pipe Line Company has been organized by a group of independent oil operators in Texas, New Mexico, Arizona, and California for the purpose of constructing a pipe line from the Permian Basin in West Texas to California. It will be a 20-in. line having a capacity of 200,000 bbl a day, according to present plans, and will make deliveries to the Los Angeles area. Cost of the system is estimated at $66,000,000. Plans also include construction of a 15,000-bbl-per-day refinery at Florence, Arizona.

The president of West Coast Pipe Line Company is R. J. Bradley of Dallas, who also is president of San Juan Oil Company. R. L. Foree, president of the Texas Independent Producers and Royalty Owners Association, Dallas, and Jack Frost, Dallas, are vice presidents. Jay Simmons, Dallas, is secretary-treasurer.

## Columbia Subsidiaries Given Temporary Permit

The Federal Power Commission has granted temporary authorization for four subsidiary companies of The Columbia Gas System, Inc., to make additions to their natural gas transmission systems in Ohio, West Virginia, Pennsylvania, and New York.

The four companies are The Manufacturers Light and Heat Company, Cumberland and Allegheny Gas Company, Natural Gas Company of West Virginia, and Home Gas Company, all with main offices in Pittsburgh, Pennsylvania.

Manufacturers will construct approximately 48 miles of line ranging from 4 to 16 in. in diam at various points on its system in Ohio, Pennsylvania, and West Virginia, and install two additional 500-hp compressor units and dehydration equipment at an existing compressor station. In addition, Manufacturers plans to retire a total of about 7.8 miles of line and an aggregate 970 hp in compressor units in Pennsylvania.

Natural Gas Company of West Virginia will build about 4.5 miles of 4, 6, and 8-in. line in Ohio. Home Gas Company will install a meter and regulating station in Rockland County, New York, for the purpose of selling gas to Rockland Gas Company, Inc., for resale in Ramapo, Tuxedo, Tuxedo Park, and Sloatsburg, all in New York.

The Cumberland and Allegheny project involves the construction of a 65-hp compressor station in West Virginia. The company's proposal to build about 10 miles of line in West Virginia was not included in the temporary authorization.

# With the PIPE LINE CONTRACTORS

**Anderson Brothers Construction Company,** 707 North Drennan Street, Houston, Texas, is expected to complete sometime in October the United States part of the Interprovincial Pipe Line, which is being constructed, and will be operated as, the Lakehead Pipe Line Company. To the middle of September, 263 miles had been ditched of a total of 322 miles, between Gretna, Manitoba, and Superior, Wisconsin. This section is being laid of 18-in. pipe.

The contractor has begun work on the 180-mile section of 26-in. that is being laid for Trunkline Gas Supply Corporation between Darnell, Louisiana, and Senatobia, Mississippi. The crossing of the Mississippi River near James, Mississippi, is also under way. Dewey Whitworth is in charge of the mainline work and Frank McCoy of the crossing construction of the 217 miles of 24-in. from Longville, Louisiana, to Altair, Texas, will not begin until the early part of 1951.

For Tennessee Gas Transmission Company, 45 miles of 30-in. are being laid between Lancaster and Campbellsville, Kentucky, and 75 miles of 26-in. between Morehead to Fullerton, Kentucky, and from Load to Catlettsburg, Kentucky.

**Houston Contracting Company,** 3272 Westheimer Road, Houston, Texas, began in August on the work contracted with Trunkline Gas Supply Company. The contract calls for the laying of 176 miles of 26-in. pipe between Longville, Louisiana, and Darnell, Louisiana; 41 miles of 10-in. and 18 miles of 6-in. laterals from Longville to the southwest Louisiana area. A field office has been opened at Rayville. Earl Norris is superintendent, R. E. Thornton spread foreman, and R. J. Axsom and Fred Brooks are in the office.

**Parkhill Truck Company,** (stringing contractor), P.O. Box 1856, Tulsa, Oklahoma has the following work under way:

112 miles of 26-in. for Mary Construction Company on Northern Natural Gas Company work from Holmes, Iowa, to Farmington, Minnesota. Charles Sampson is foreman.

109 miles of 26-in. for Midwestern Constructors on Northern Natural Gas Company line from Plattsmouth, Nebraska, to Ogden, Iowa. Curtis Williams is foreman.

180 miles of 26-in. for Anderson Brothers Corporation on Trunkline Gas Supply Company job from Darnell, Louisiana to Senatobia, Mississippi. R. C. Parker is foreman.

217 miles of 24-in. for Anderson Brothers on Trunkline Gas Supply Company job from Longville, Louisiana to Garwood, Texas.

33 miles of 10-in., 18 miles of 16-in., 8 miles of 10-in. on Trunkline Gas Supply Company job for Houston Contracting Company between Longville, and southwest Louisiana.

176 miles of 26-in. line for Houston Contracting Company on Trunkline Gas Supply Company between Longville, Louisiana, and Darnell, Louisiana. R. M. Hiser is foreman.

100 miles of 26-in. for Midwestern Construction on Texas Illinois line from LaGloria to Refugio, Texas.

417 miles 30-in. for Section 7, 8, 9, and 10 for the Texas Illinois Pipe Company system for W. A. Bechtel Company from Texarkana, Arkansas to the Mississippi River near Cape Girardeau, Missouri. Gordon Walden is foreman.

For Midwestern Constructors, Inc., 300 miles of 30-in. for sections 11, 12, and 13, from the Mississippi River near Cape Girardeau, Missouri to Joliet, Illinois on the same line.

196 miles of 30-in. for Smith Contracting Corporation on Transcontinental line from North Carolina border to the Potomac River. Harold Deatherage is foreman.

340 miles of 18-in. for Anderson Brothers Corporation on Lakehead Pipe Line Company spread from Neche, North Dakota to Superior, Wisconsin. Jimmie Stubblefield, H. C. Peterson, Buck Miller, and O. C. York are the foremen.

**Arabian Bechtel Corporation,** 220 Bush Street, San Francisco, California, has contracted with Iraq Petroleum Company, Ltd., to lay 566 miles of pipe line from Kirkuk to Baniyas. Most of the pipe will be 30 and 32 in.; 90 miles will be 26 in. First pipe was scheduled for laying in October. Clark Rankin, Bechtel vice president, is project manager.

**Williams Brothers-Davis Company,** 6006 Jensen Drive, Houston 16, Texas, is laying 85 miles of 30-in. for Transcontinental Gas Pipe Line Corporation, the section extending from El Campo, Texas, to a point north of Humble, Texas. The field office is at Humble. H. L. Davis is in charge of construction work. Sam Davis is timekeeper.

**Latex Construction Company,** 2707 Ferndale Place, Houston, Texas, began in August the laying of 95 miles of 20-in. for Tennessee Gas Transmission Company, extending from Natchitoches to Kinder, Louisiana. Headquarters are at Leesville. J. B. Latham is superintendent.

Also for Tennessee Gas, 105 miles of 16-in. are being laid between Sale and Kinder, Louisiana. The field office for this work is at Franklin. H. L. Leake is superintendent and S. B. Harrison is in charge of the office.

For Tennessee Gas, 10 miles of 26-in., consisting of land lines approaching the Mississippi River bridge at Greenville and four lines suspended on the bridge, are being completed. Headquarters are at Lake Village, Arkansas. H. E. Murphy is superintendent, J. H. Mabry office manager.

Work has been resumed on two 16-in. submarine lines across the Mississippi River just below the Greenville bridge for Tennessee Gas. This work was begun last winter but was not completed due to floods. The field office is at Greenville, with J. A. Cantrell superintendent and A. E. Stremmel office manager.

The middle of September work began on about 24 miles of 12-in loops for Southern Natural Gas Company between Douglas and Newnan, Georgia. A field office has been opened at Newnan. O. R. Mitchell is superintendent.

**Mahoney Contracting Company,** Hersee Building, Mt. Pleasant, Michigan, had completed 30 miles on its section of the Trunkline Gas Supply Company system to September 20. The section consists of 186 miles of 26-in. between Tuscola and Joppa, Illinois.

For Michigan Gas Storage Company, 35 miles had been completed on the 86 miles of 22-in. from St. John to Marion, Michigan.

The company has contracted to lay 27 miles of 12-in. for Dow Chemical Company between Loomis and Midland, Michigan. This work will begin about November 1.

**Williams Brothers Corporation,** National Bank of Tulsa Building, Tulsa, Oklahoma, has completed the 336-mile, 16-in. section of Interprovincial Pipe Line Company's system from Regina to Gretna. B. E. Barnes was general superintendent over the work, with spread superintendents consisting of "Whitey" Martin, Clyde Gregory, and "Pee Wee" Petty.

**Smith Contracting Corporation,** 205 Northwest Seventh Street, Fort Worth, Texas, will finish about October 10 Section 11 of Transcontinental Gas Pipe Line Corporation's system. Two spreads are in the field. One office is at Fredericksburg, Virginia, where C. C. Craig is superintendent and H. J. McAdams office manager. Another office is at Herndon, Virginia, and Jack Landers is superintendent with M. E. Williams office manager. The contractor completed Section 10 sometime ago. The two sections total 196 miles and extend from Chatham, Virginia, to the Potomac River.

Pipe was due to arrive September 26 for 108 miles of 16-in. between Baytown and Provident, Texas, for Texas Eastern Transmission Corporation. In the meantime the right-of-way was completed and road crossings installed.

**H. C. Price Company, Pipeline Division,** Box 1111, Bartlesville, Oklahoma, is constructing 373 miles of 26-in. high pressure natural gas pipe line for Tennessee Gas Transmission Company from the north bank of Ohio River, east of Portsmouth, Ohio, and northeastward to a point near Buffalo, New York. Work on the initial section of nearly 220 miles through Ohio has been completed. Work on the 153-mile section through Pennsylvania and New York is scheduled for completion in November. Spreads are located as follows:

Corry, Pennsylvania, Box 289: G. A. Reutzel, superintendent; W. E. Yount, office manager; J. A. Hairston, right-of-way foreman; L. J. Loncarich, ditch foreman; J. C. Anderson, bending foreman; H. C. Morrison and K. N. Adkins, pipe foremen; R. W. Orr, welding foreman; S. J. Wood, coating foreman; A. L. Bell, lower-in foreman, and T. E. Walker, clean-up foreman.

Dunkirk, New York, Box 177, Telephone 7944: R. K. Shivel, superintendent; R. E. Burgess, office manager; J. D. White, right-of-way foreman; W. H. Olrich, ditch foreman; J. H. Latham, bending foreman; C. E. Shivel, pipe foreman; R. L. Ezell, welding foreman; U. M. Beaver, lower-in foreman; Sam Price, clean-up foreman, Ray Drewell, crossing foreman.

The company also has the general contract covering construction of approximately 480 miles of main transmission line for Texas Illinois Natural Gas Pipeline Company from near Refugio, Texas, extending northeastward to the Texas-Arkansas state line near Texarkana. The contract includes 38 miles of 12-in.; 36 miles of 24-in.; 97 miles of 26-in., and 309 miles of 30-in. Right-of-way work is now underway on the 24-in. section out of Wharton and on the 30-in. out of Cleveland, Texas. Work on the multiple crossing of the Trinity River will begin shortly. Spreads are located as follows:

Wharton, Texas, General Delivery: W. B. Williams, superintendent; P. O. Rutledge, office manager; R. H. Edwards, right-of-way foreman; K. K. Kelly, ditch foreman; Roy Stegall, bending foreman; J. I. Cobb, pipe foreman; C. F. Jones, welding foreman; Rube Owens, coating foreman; A. D. Hamilton, lower-in foreman, and Fred Williams, clean-up foreman.

Cleveland, Texas, General Delivery: C. R. Ice, superintendent; G. A. Harvey, office manager; John E. Hamilton, right-of-way foreman; E. W. Whisenant, ditch foreman; Forest Loinette, bending foreman; W. T. Dickerson, pipe foreman; L. O. Reutzel, welding foreman; N. D. Adams, coating foreman; J. C. Rich, lower-in foreman, and E. D. Worley, clean-up foreman.

**Dunn Brothers,** 801 Mercantile Securities Building, Dallas, Texas, (stringing contractors), are working on the following contracts:

For El Paso Natural Gas Company, 415 miles of 24-in. between Fruitland, New Mexico, and Yucca, Arizona (San Juan line).

H. C. Price Company (Tennessee Gas Transmission Company), 400 miles of 26-in. in Ohio, Pennsylvania, and New York.

Conyes Construction Company (Montana-Dakota Utilities Company), 340 miles of 12-in. in Wyoming and Montana.

El Paso Natural Gas Company, 419 miles of 30-in. in New Mexico, Texas, and Arizona.

**Associated Pipe Line Contractors, Inc.,** 3272 Westheimer Road, Houston, Texas, is laying 84 miles of 18-in. for Portland Pipe Line Company between Gorham, New Hampshire, and the Canadian border. Lacy Walker is spread superintendent.

Work is being completed on the Transcontinental Gas Pipe Line Corporation job from Rockville, Maryland, to Conawingo, Pennsylvania, consisting of 75 miles of 30-in. This job has been in charge of J. A. Williamson as general superintendent, Cecil Rogers spread foreman, and W. H. Flowers double-jointing.

Associated has contracted to lay 161 miles of 16 and 18-in. for Southern Natural Gas Company in Alabama and Georgia, with the work expected to begin sometime this month.

**H. L. Gentry Construction Company,** 921 Michigan Avenue, Jackson, Michigan, is working out of Toledo, Ohio, to construct the 125-mile, 8-in. products pipe line for Susquehanna Pipe Line Company from Toledo to Sarnia, Ontario, Canada. This project is scheduled for completion about December 1. James Mitchell is superintendent.

**J. L. Cox and Son,** Raytown, Missouri, (stringing contractors), are stringing 236 miles of 16, 18, and 24-in. pipe in Mississippi and Alabama for Southern Natural Gas Company. Fred Osterman and Lionel Pugh are foremen.

**Midwestern Constructors, Inc.,** 105 North Boulder Street, Tulsa, Oklahoma, is well along with its work for Northern Natural Gas Company. Section 6, 43.4 miles of 26-in. between Palmyra, Nebraska, and Oakland, Iowa, and Section 7, 65.9 miles of 26-in. from Oakland northeastward, were approximately 70 per cent completed the middle of September. A field office is maintained at Atlantic, Iowa. M. T. Wilhite is superintendent and Denver Franklin assistant superintendent. At Palmyra an addition is being made to the compressor station. In charge of Lyle S. DeWitt, superintendent, this work is about 60 per cent completed. An addition is also being made to the station at Beatrice, Nebraska, which is better than half completed. This job is in charge of J. A. Bard.

The 39 miles of 12-in. from Hawarden, Iowa, to Sioux Falls, South Dakota, for Great Lakes Pipe Line Company has been finished. For this same company additions are being made to the pumping stations at Mankato and Sioux City. Work at the former is in charge of Earl S. Powell and is about 60 per cent completed. At Sioux City, F. C. Snavely is superintendent and this work is about 35 per cent completed.

Several "schedules" of the Texas Illinois Natural Gas Pipeline Company have been contracted by Midwestern. Work is to begin about October 25 on Schedule 1, 100 miles of 26-in. from LaGloria to Refugio, Texas. A month later Schedule 11 will get underway. This consists of 100 miles of 30-in. from the Mississippi River near Chester, Illinois, to Effingham, Illinois. Work will not begin on schedules 12 and 13 until in 1951. Schedule 12 consists of 100 miles of 30-in. from Effingham to Sibley, Illinois. Schedule 13 consists of 92 miles of 30-in. and extends from Sibley to Joliet. A crossing of the Illinois River near Morris also has been contracted.

**Bechtel-Price-Conyes,** 220 Bush Street, San Francisco, California, announces that the 506-mile, 34-in. gas line of Pacific Gas and Electric Company from Topock, Arizona, to Milpitas, California, will be completed in the fall of this year. Work is now in progress near Kettleman Hills, California. R. L. Bowman is general superintendent, M. V. Scott manager of the mainline office at Coalinga, California, and Steve Valline administrative manager at San Francisco.

**Sheehan Pipe Line Construction Company,** 529 National Bank of Tulsa Building, Tulsa, Oklahoma, had completed 84 miles to September 20, and expected to complete the entire job by about November 1, on the 180 miles of 18-in. being laid for Southern Natural Gas Company between Gwinville, Mississippi, and Selma, Alabama. The company has been working two spreads but one spread was out of pipe for about 20 days.

Another job for Southern Natural will be 32 miles of 16-in. from Wetumpka to Tallassee, Alabama. This work has not yet started but is scheduled for completion by December 1.

**Ray L. Smith and Son, Inc.,** El Dorado, Kansas, are at work on 104 miles of 18-in. for the Commonwealth Natural Gas Corporation, between Stanardsville and Richmond, Virginia. The contractor is working two spreads. One spread has its headquarters at Orange, Virginia, where Don C. Smith is superintendent. The other spread has its office and warehouse at 5606 West Broad Street, Richmond. Wm. G. (Bill) Frost is spread superintendent. Ray Leigh Smith is general superintendent over both spreads.

Also under contract with Commonwealth Natural are 84 miles of 12-in., 20 miles of 8-in., and various laterals between Richmond and Newport News.

**Canadian Bechtel, Ltd.,** and **Fred Mannix & Company, Ltd.,** Calgary, Alberta, Canada, have completed the 441 miles of 20-in. crude oil line between Edmonton and Regina for Interprovincial Pipe Line Company.

**Bechtel Corporation, H. C. Price Company,** and **Midwestern Constructors, Inc.,** are at work on 409 miles of 30-in. for Texas Illinois Natural Gas Pipeline Company. These three companies are laying as a joint venture the Arkansas and Missouri portions of the line. The field office is at the Airport in Newport, Arkansas. E. W. Davis is project manager, A. M. Berlander general superintendent, and E. C. Elting office manager.

**Texas-Southern Contracting Company,** 804 Dan Waggoner Building, Fort Worth, Texas, has moved its field office from Liberty, Texas, to 360 Center Street, Beaumont, Texas, on the Transcontinental Gas Pipe Line Corporation job. Approximately 60 miles have been completed of the 92 miles of 30-in. that is being laid between Deweyville and Porters, Texas. Merle Tatom, who suffered a broken leg sometime ago, is now in a Fort Worth hospital. The leg had to be reset and this, of course, has delayed his recovery. In the meantime, the spread work is being supervised by his father, "Red" Tatom. The Trinity River crossing has been completed and the crew moved to Deweyville for the Sabine River crossing. The latter is now about half finished. "Borger Red" McMenamy is spread foreman.

Weather permitting the United Gas Pipe Line Company job will be completed about October 10. This work consists of 24 miles of 16-in. from Cameron Parish to Gulf's refinery at Port Arthur, Texas. The crew is working out of Port Arthur with F. O. "Banty" Traweek superintendent and Q. B. Davis, Jr., office manager.

**Price-Morrison,** Lockhart Building, 311 East Eleventh Street, Austin, Texas, have a joint venture general contract covering construction of 158 miles of 30-in. high pressure natural gas pipe line for Tennessee Gas Transmission Company in western Tennessee and Kentucky. Contractors: Price Constructors, Inc., Bartlesville, Oklahoma (sponsor), and Morrison Construction Company, Inc., Austin, Texas. Work was approximately 75 per cent completed as of September 10. Spreads located as follows:

Linden, Tennessee, General Delivery: Jack Hodges, superintendent; A. G. Goyne, office manager; Dick Rash, right-of-way foreman; Red Wright, ditch foreman; Ralph Farrar, pipe foreman; Harry Ebers, welding foreman; Cowboy Tatom, bending foreman; E. E. Wilkerson, lower-in foreman; Willie Sullivan, clean-up foreman; Jack W. Bradfield, crossing foreman, and Frank Coleman, bending foreman.

Adamsville, Kentucky, General Delivery: R. L. McMillon, superintendent; E. J. Price, office manager; W. K. Stowell, right-of-way foreman; John Dyer, ditch foreman; Rex Pickens, pipe foreman; Ab Campbell, welding foreman; Rip Vann, dope foreman; Ray Huston, bending foreman; Leon Pharris, lower-in foreman; G. B. Whitehead, clean-up foreman, and J. L. Hodge, double-joint foreman.

**Oklahoma Contracting Corporation,** 1210 Mercantile Bank Building, Dallas, Texas, has completed between 70 and 75 miles (to September 20) of the 85 miles of 18-in. it is laying for Portland Pipe Line Company between Portland, Maine, and Gorham, New Hampshire. The field office is now at Gorham. H. A. Wylie is superintendent and Lisle W. Chambers paymaster.

The Transcontinental Gas Pipe Line Corporation Line from Edgewater to Elizabeth, New Jersey, 23 miles of 30-in., has been completed.

Approximately 29 miles had been completed to September 20 of the 80 miles of 26-in. being laid for Transcontinental from Refugio, Texas, south. The field office is at Edna. "Panama" Shiflett is superintendent and Earnest Smith paymaster.

Rain slowed work on the Tennessee Gas Transmission Company job in Mississippi and 28 miles remain to be laid (September 20). From Sunflower County to Marshall County 90 miles of 30-in. pipe are being laid. One spread has headquarters at Batesville, Mississippi, where Raymond Law is superintendent and Gene Gohring paymaster. Another spread has offices at Cleveland, Mississippi. Louis Visentine is superintendent and V. C. Eason paymaster.

**R. H. Fulton and Company,** Box 1526, Lubbock, Texas, had completed (September 20) 20 per cent of the 155 miles of 20-in. being laid for Northern Natural Gas Company between Jetmore and Bushton, Kansas. Jerry Nash is superintendent. From Concordia to Salina, Kansas, 73 miles of 26-in. are being laid for the same company and this job also was 20 per cent completed. M. L. Boyd is superintendent. Work had just begun on 184 miles of 26-in. between Senatobia, Mississippi, and Jappa, Illinois, for Trunkline Gas Supply Company. Ed Veach is superintendent and Bill Gray field office manager. Clark Williams is general superintendent in charge of all the above work.

Also just starting is 264 miles of 20-in. between McAllen and Altair, Texas, for Trunkline Gas Supply Company. The field office is at El Campo, Texas, with J. T. Brodie the superintendent. This job is a joint venture between R. H. Fulton and J. T. Brodie.

**Conyes Construction Corporation,** 2884 San Pablo Avenue, San Pablo, California, has been awarded a contract to lay 172 miles of 20 and 22-in. pipe for the Ohio Oil Company between Vandalia, Illinois, and Carlos, Indiana. This is a part of the 226-mile line being constructed by Ohio from Wood River, Illinois, to Lima, Ohio.

# NEWS

## Continental Begins Work On Gigantic Research Lab

Continental Oil Company launched construction of its projected $2,250,000 research laboratory building with a ground-breaking ceremony in Ponca City, Oklahoma on September 12. With the ceremony a nation-wide program was inaugurated to celebrate the company's 75th anniversary.

A series of employee celebrations at 43 points throughout the nation will be held in observance of the 75th anniversary of Continental's founding in Ogden, Utah in 1875.

Featured address at the Ponca City ceremony was delivered by Dr. James Rhyne Killian, Jr., president of Massachusetts Institute of Technology, Cambridge, Massachusetts. L. F. McCollum, Conoco president, gave the opening speech, following a company-wide address by telephone hook-up to gatherings of Continental employees at 36 points throughout the company's territory. During his speech the president announced a company college scholarship program for sons and daughters of Continental employees. Theme of the company's 75th anniversary celebration is, "We're Breaking Ground for Another 75 Years."

Special guests were introduced after the ground-breaking and Continental's "old timer" employees, those with 25 years of service were given special recognition.

At the Continental Oil Company's 75th anniversary, L. L. Davis, manager, development and research department, with spade, above, turned the ground for the projected laboratory building. Others are, left to right: W. C. MacMillan, executive vice president; Harold G. Osborn, vice president and general manager of Ponco City operations and master of ceremonies; Dr. James R. Killian, Jr., president of MIT, and Continental's president, L. F. McCollum.

## Mexican Oil Output Rises 22% in First Half

Crude oil production for the second quarter in Mexico was up 7 per cent from the first quarter, Petroleos Mexicanos (Pemex) has reported. Production totaled 17,905,101 bbl, compared to 34,614,890 bbl produced during the first quarter. Antonio Bermudez, director general, predicted further increases in the third quarter, with the operation of a new 30,000-bbl refinery at Salamanca.

Gas production equivalent to 5,336,763 bbl in the second quarter, was 16.5 per cent higher than in the first quarter. Half-year output was up 20 per cent over the first half of 1949. Refinery runs of 15,613,296 bbl for the second quarter brought the half year total to 30,690,383 bbl, almost 10 per cent above the first half 1949 rate. In the first half of this year, 77 development wells and 5 exploration wells were drilled. This compared with 56 development and 12 exploration wells drilled for a like period of 1949. Footage drilled for development wells rose from 1[illegible],678 to 304,926 ft.

## February Production Is Above January Rate

During February, world production of crude petroleum averaged 9,471,000 bbl daily, an increase of 7000 bbl per day compared with the January production rate. Principal increases in daily average production over January were: U. S. 45,000, Saudi Arabia 46,000, Iran 31,000, and Indonesia 19,000 bbl. Production in Kuwait decreased 7000 bbl daily. Venezuelan crude daily average production decreased 146,000 bbl from January.

Crude imports of Western Europe averaged 620,000 bbl daily compared with 544,000 in January. Crude runs to stills of 9,425,000 bbl daily were 100,000 bbl daily below the January rate. Stocks of crude petroleum decreased 125,000 bbl daily during February, compared with a stock decrease of 235,000 bbl per day in January.

## Technical Index Available

A subject index to technological documents issued in Volume 12 of the *Bibliography of Technical Reports* is now available to the public, the U. S. Department of Commerce has announced. The new index enables researchers to locate reports on any subject carried by the *Bibliography* in the period July-December 1949. Copies may be purchased from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C., at $1 per copy.

## Research Agreement Made

The Pennsylvania Grade Crude Oil Association has renewed until July 1, 1951 its cooperative research agreement with the Franklin, Pennsylvania, station of the U. S. Bureau of Mines. C. E. Streeter of Bradford, Pennsylvania, association president, represented the oil organization in agreeing to supply funds to the Franklin station to supplement its federal appropriation for research in secondary recovery of oil. Sam S. Taylor is director of the Franklin station.

J. P. Jones of Bradford, director of production for the Association, pointed out that very little has been learned about the effects of explosives in fracturing oil-bearing formations since the Roberts torpedo first was used in the early days of the industry. As a result of the new experiments, he said, it is hoped to develop better explosives and more effective methods.

**Dallas Nomads.** Some members and guests at the regular meeting of the Dallas, Texas, Nomad Chapter September 11. First row: Tom E. Morton of Halliburton Oil Well Cementing Company; Carl Taylor of Wichtex; F. M. Gilmore and Jim Herrick of Cardwell Manufacturing Company, Hank Zoller of Derby Oil Company; Keith Steinhoff of Grand Prairie Rubber Company; Dan Sable of Riss and Company. Second row: J. E. Bauer of Ideco; Abbott Sparks of The Petroleum Engineer; Hank Davis and Bill Gibson of Twin Disc Clutch Company; Dan Barr and Mike Hazel of Oil Well Supply Company. Third row: H. E. Bawerman of Grand Prairie Rubber Company; Fred Adamson of Twin Disc Clutch Company; H. K. McArthur of Halliburton Oil Well Cementing Company; and Tom C. Waldrip of Grand Prairie Rubber Company.

## European Oil Industry Advances With U.S. Aid

With the help of the United States, the petroleum industry in Western Europe is reported making long strides forward. Officials say that since the beginning of the Marshall Plan in April 1948, the refinery capacity west of the Iron Curtain has nearly doubled. In the period ending June 30, the United States had allocated for rebuilding of old and construction of new refineries, a total of $29,917,000 in ECA funds. France received the largest share, $12,628,000, the United Kingdom received $9,705,000, and Italy $7,584,000.

The ECA investment represented only a minor part of total expenditures by the three powers in the refinery construction program. Total cost has amounted to $185,834,000 according to ECA figures.

Total refinery capacity in France at the beginning of the ECA program, was 480,000 bbl daily. The ECA estimates it is now nearing 810,000 bbl and that by June 30, 1953 it will be up to 1,160,000 bbl daily. In Western Europe refinery capacity is reported back up to peak pre-war levels.

Some money has also been spent by the ECA toward helping in explorations for oil in southern France along the Spanish border, in eastern France near Germany, and in North Africa. ECA aid has been used to step up production in known fields of Germany along the Dutch border, where the 1948 output of 12,000 bbl daily has been increased to 22,000 bbl.

## IPAA Sets Up 5-Point Plan For Steel Conservation

The Independent Petroleum Association of America's materials committee has set up a 5-point plan to insure adequate steel supplies for oil producers.

They are: (1) allocation of steel to fabricators of oil field tubular goods must be adequate to permit necessary expansion of oil exploration and development; (2) tubular goods and other field equipment should be equitably distributed to the petroleum industry only for current use; (3) in order to insure the drilling of every needed well, equitable distribution to the small operators should be provided. Distribution should be flexible to provide for unforeseen or unscheduled drilling activities. (4) Stockpiling or unnecessary inventory amounts of tubular goods should be avoided by oil operators, and (5) the petroleum industry should employ methods of making the most efficient use of available materials.

## ECA, Oil Firms Confer

The Economic Cooperation Administration is now engaged in conferences with officials of the three American oil companies against which it aimed a major price reduction order last month on sales of Middle-East petroleum products to western Europe. Although the letter written to the American oil companies notifying them of the price action was not made public, it is said to constitute a detailed indictment of the companies' pricing practices in sales of Mid-East oil products to the European market. The three companies involved are California-Texas Company, Standard Oil Company (New Jersey), and Socony-Vacuum Oil Company.

In an explanatory bulletin to western European governments, ECA stated that the order "substantially eliminates the price discrimination" by which ECA charged the three companies favored northwest Europe, the United Kingdom, and Scandinavia over the rest of Western Europe.

## API Barbecue Held

The Seminole, Oklahoma, chapter of the American Petroleum Institute held its annual barbecue and picnic at the east end of Wewoka Lake Dam, last month. The stag party afforded plenty of eats and a good time for all.

The successful use of heavy fuels in any Diesel requires careful planning, particularly if the engine has been originally designed to burn standard fuels. The changes in the combustion phenomena alone warrant close attention, and adjustments must be made to compensate for them.

"Since these changes generally affect the operation of the piston rings, many operators have called in Cook's engineers to make an engine analysis and to submit the recommendations needed to assure maximum availability and minimum maintenance costs.

"These analyses of engines, operating under actual load conditions in the field, have turned up many interesting and valuable facts—facts which could only be obtained by electronically indicating the engines and carefully checking all other phases of operation."

This wealth of information is yours to make use of in getting better performance. You can get it by asking Cook's Engineers to make a "Job-Engineered" survey of your plant before changing rings. In this way, you can be sure of getting rings selected for your specifications.

C. Lee Cook Mfg. Co., Incorporated, Louisville, Ky. Branch offices in Baltimore, Boston, Chicago, Cleveland, Houston, Los Angeles, Mobile, New Orleans, New York, San Francisco and Tulsa.

COOK GRAPHITIC IRON
PISTON RINGS

. . . SEALING PRESSURES SINCE 1888 . . .

# NEWS

## Oil Stocks Rise Sought

Officials of the Munitions Board, National Security Resources Board, and Interior Department are trying to build up depleted stocks of bulk oil products, but there is no prospect of an early move toward adding them to the government's strategic stockpile of raw materials. The armed services have launched a construction program to increase storage facilities for bulk products, but have neither the funds nor facilities to stockpile aviation gasoline components that are in tight supply.

The idea of stockpiling bulk oil products has received a lot of attention since the Korean outbreak in June, however, officials state that as yet they have no plans for carrying it out. They draw a sharp distinction between a "strategic stockpile" and "operating stocks". Strategic stockpiling is accumulating stores of critical raw materials against the day supply channels are cut off. Operating stocks are part of current supply channels, filling current needs.

## Secondary Recovery Meet

West Virginia Geological Survey is sponsoring a meeting on secondary recovery of oil in the state to be held at Morgantown, October 13 and 14, in cooperation with several other groups. Dr. Paul H. Price will preside over the conference. Paul D. Torrey, chairman of the Compact Secondary Recovery Advisory Committee, will deliver a paper on "Economic Significance of Secondary Recovery in West Virginia." Albert E. Sweeney, Jr., director of the Compact's Secondary Recovery division, will address the conference on "Recovery Practices of Other States Applicable to West Virginia."

## Brazil Increases Oil Stocks

The Brazilian Government is planning to build up a substantial stockpile of oil and other essential fuels. Jose Braz, chief of the government's Export-Import Control Department, stated that the war in Korea has brought out the fact that the country's storage of gasoline, fuel oil, and other products is sufficient only for 6 months. Braz added that additional tankage would be constructed for a capacity of more than a year's supply. Cost of additional stocks of all commodities, including oil as well as industrial equipment, transportation machinery, and accessories, is estimated at $150,000,000 worth of foreign exchange.

## U.S., British Aids Confer

The United States and Great Britain have been holding conferences to discuss steps that might be taken to assure adequate supplies in the event of a world-wide war. The talks, part of a continuing discussion and preliminary in nature, are going on between State Department officials and a 4-man British delegation.

## Accident Record Low

Motor vehicles operated by the petroleum industry in 1949 traveled the equivalent of 75,188 miles each without an accident, figures compiled by the American Petroleum Institute indicate. The Institute's 18th annual survey of motor vehicle accidents in the industry shows the lowest frequency rate in four years and the lowest number of accidents per vehicle operated in three years.

## Oil Industry Under NPA

Among other industries, the oil industry has been transferred to the jurisdiction of the National Production Authority to administer necessary priority, allocation, and inventory controls. Secretary of Commerce Charles Sawyer in announcing the creation of this new division, stated that William Henry Harrison is administrator.

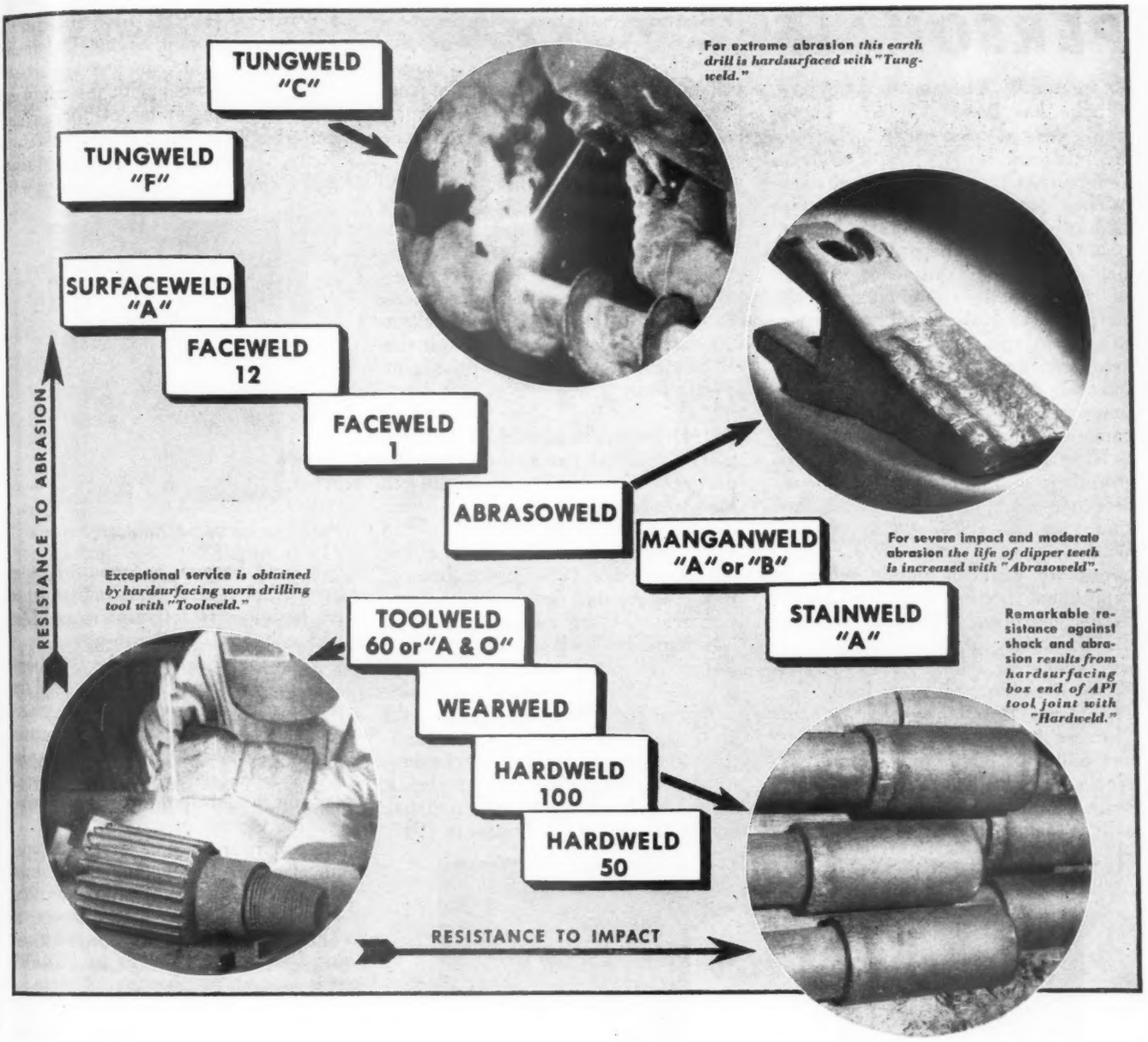
The new agency will be responsible, (1) for determining requirements of materials needed to maintain national defense, the civilian economy, and established foreign policies of the United States; (2) for formulating and executing policies and programs by which the American economy can meet these requirements. Harrison is on leave from his position as president of the International Telephone and Telegraph Corporation while serving as administrator for NPA.

**The Houston Nomads** at their September meeting welcomed back their president, E. H. Lorehn of Cameron Iron Works, who has been on an extended leave. Visitors attending the meeting were: Front row, M. Coyle, Troco, Columbia; C. G. MacDonald, Mexican-American Independent Company I. B. Allen, Peticon, Caracus, Venezuela; back row, Ed Upton, general manager, F. H. Maloney Company; Don Meek, Mexican-American Independent Company; Ray Kail, Export Manufacturers representative. Houston Nomads meet the second Monday of each month at Ye Ole College Inn.

## Forms South American Petroleum Assembly

In accordance with the decision of the advisory board of the South American Institute of Petroleum, the first South American Assembly of Petroleum will be organized in Montevideo March 12-16, 1951. This assembly will have the following principal objectives: (a) to study the way to intensify the production of petroleum and its derivatives in South America; (b) to consider the ways to obtain maximum economy in the production and utilization of petroleum; (c) to examine the possibilities of increasing the interchange of combustibles between the South American nations: (d) to intensify the growth of friendly relations and the interchange of ideas bebetween persons in the industry.

The Uruguay section of the South American Institute of Petroleum has just designated a committee that will have in its charge the organization of the assembly, acting as the central body of the Institute (Avenida Agraciada 1464 Montevideo). Carlos R. Veigh Garzón is president; Germán E. Villar, secretary; Coronel Tydeo Larre Borges, treasurer; Salvador Masson, and Ernesto Pelufo, members.


TUNGWELD "C"
TUNGWELD "F"
SURFACEWELD "A"
FACEWELD 12
FACEWELD 1
ABRASOWELD
MANGANWELD "A" or "B"
STAINWELD "A"
TOOLWELD 60 or "A & O"
WEARWELD
HARDWELD 100
HARDWELD 50
RESISTANCE TO ABRASION
RESISTANCE TO IMPACT
For extreme abrasion this earth drill is hardsurfaced with "Tungweld."
For severe impact and moderate abrasion the life of dipper teeth is increased with "Abrasoweld".
Exceptional service is obtained by hardsurfacing worn drilling tool with "Toolweld."
Remarkable resistance against shock and abrasion results from hardsurfacing box end of API tool joint with "Hardweld."

# HOW TO SAVE 35¢ ON EACH ELECTRODE DOLLAR
## and get longer hardsurfacing wear

BY using Lincoln hardsurfacing you can cut your electrode costs an average of 35%. That's because Lincoln hardsurfacing electrodes not only sell for approximately one third less than other makes but give you longer wear, according to user reports.

From Lincoln's complete line, you are sure also of getting the *correct* hardsurfacing material for every job. Each of the 12 job-developed electrodes has been designed to fulfill a specific range of service. Thus, there is no need for any compromise between hardness for wear resistance and toughness for impact.

Why not investigate these cost-saving advantages now. Write for your free, handy Lincoln bulletins on hardsurfacing.

GET THE FACTS

*Send for free Lincoln Bulletin 466, Weldirectory for Hardsurfacing and Bulletin 469, Hardsurfacing Guide. Write*

**THE LINCOLN ELECTRIC COMPANY**
Dept. 187, Cleveland 1, Ohio

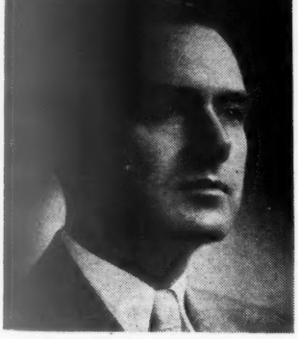
LINCOLN

*Sales Offices and Field Service Shops in All Principal Cities*

# PERSONALS

**Chester W. Cleveland** of Chicago, Illinois has been appointed to the newly created post of director of public relations, for Phillips Petroleum Company. Cleveland, who will make his headquarters in Bartlesville, Oklahoma, is a 28-year veteran of newspaper, magazine, and public relations fields. The new position of director of public relations is created for the purpose of centralizing all matters pertaining to company publicity, press relations, and the preparation and handling of public statements such as news releases, magazine articles, and communications to stockholders.

**R. C. Jopling,** heretofore vice president public relations, becomes vice president advertising, and continues in charge of the company's Washington, D. C. office. **F. L. Rice,** heretofore manager public relations department, becomes manager advertising department. After four years at the University of Illinois, where he was managing editor of *The Daily Illini,* Cleveland was graduated in 1921 from the Babson Institute of Business Administration. He is a former editor of both *The Magazine of Sigma Chi* and *The Quill* of Sigma Delta Chi, national professional journalistic fraternity.



J. W. Foley

**James H. Pipkin,** former assistant to the chairman of the board of The Texas Company, has been named general manager, industrial and public relations. He succeeds **James Tanham** who recently retired. Pipkin attended Texas A. and M. College and the University of Texas, receiving his Bachelor of Law degree from the latter institution in 1931. He entered the service of The Texas Company in 1934 in the legal department at Houston, Texas.

**James W. Foley** has been appointed assistant to the chairman of the board of The Texas Company, succeeding Pipkin. **A. W. Baucum** has been transferred from Houston to fill Foley's previous position of assistant to the vice president, producing department.

Foley was graduated from Texas A. and M. College in 1932 with a Bachelor of Science degree in petroleum engineering. After graduation he went to work for Texaco in the Manvel field, Texas, as a rotary rig helper and in 1933 was named district petroleum engineer at Laredo.

Baucum, also a graduate of Texas A. and M., joined Texaco in 1934 as a roustabout. After various field assignments, he was transferred to Houston in 1938, became division petroleum engineer at Tulsa in 1944, and returned to Houston in 1946 as assistant division manager, South Texas division.

**Benedict Saurino,** manager of the statistical research department, Sun Oil Company, Philadelphia, Pennsylvania has been appointed by Governor Duff of Pennsylvania to head a 15-member state economic research council to help guide the state in peace or war. In making the appointment, Governor Duff said the Council's first duty would be to recommend what steps might be necessary "for improving the usefulness, timeliness, and coverage of the State's statistical services, to report on the feasibility of collecting essential data not now obtainable from state government or private industry sources."

**O. D. Story,** head of Shell Oil Company's regional purchasing-stores department since 1947, died recently in Los Angeles, California. He had been connected with Shell for almost 28 years, and with the company's Houston office since 1933. Since June of this year, he had been on special assignment for the company, first in New York and then in California.

Through practically his entire career with Shell, he was associated with purchasing-stores activities. He held posts as division warehouseman, division storekeeper, and area purchasing-stores representative before being named head of the Houston regional purchasing-stores department in 1947.

A. W. Baucum

**Winfred H. "Major" Stueve,** an executive assistant of the Oklahoma Gas and Electric Company has retired from active service with the company after 25 years service. A former student of Ohio State University and Notre Dame, Stueve went to Muskogee, Oklahoma after college days were over and became a consulting engineer. After several years in that capacity, he joined Oklahoma Gas and Electric as an industrial consultant.

W. H. Stueve

With the opening of the Oklahoma City oil field in 1929, he was transferred to Oklahoma City and placed in charge of oil field and industrial power sales. In 1936 he was awarded a special degree in mechanical engineering, based upon his work in electrifying the oil industry.

Upon retirement, Stueve will open an office in the Oklahoma Natural Building, and will continue writing, doing consulting work, and serving as chairman of the New Industries Committee of the Oklahoma City Chamber of Commerce.

**A. K. Tyson** was elected president of American Republics Corporation, Houston, Texas, following the death of **Craig F. Cullinan, Sr.** Tyson joined Marland Oil Company in 1924 as a geologist, making his debut in the oil industry. A graduate of the University of Texas, Tyson went to Pure Oil Company from Marland, and still later he was connected with Continental Oil Company in various capacities of exploration work. In January of 1948, Tyson left Continental and became vice president of Barber Oil Corporation and director of American Republics Corporation. He was named vice president of American in 1949 and continued as a director.

**James H. Durbin** has been elected to the newly created position of executive vice president of American Republics. Other changes are: **C. T. Carnes,** treasurer, succeeding Durbin; **T. Rieber,** president of the Barber Oil Corporation, New York, elected chairman of the board; and **A. J. Wray,** Houston, elected a director.

▸ **W. O. Twaits** has been elected a director of the company, Imperial Oil Ltd. has announced. Twaits has had broad experience in the oil industry

W. O. Twaits

and is one of the foremost authorities on petroleum economics in Canada. He was educated in Sarnia and Toronto, graduating in 1933 from the University of Toronto with a Bachelor of Commerce degree. He joined the manufacturing department of the company at Sarnia the same year and after experience in the various refinery departments became production controller in 1940. Twaits transferred to Toronto in 1945 and in 1947 became manager of the coordination and economics department. In 1949 he was named management assistant in the producing department, Western division, at Calgary.

▸ **Norton Standeven** has been named division attorney for Stanolind Oil and Gas Company at Oklahoma City, Oklahoma. A graduate of Oklahoma University, Standeven joined Stanolind in Tulsa in 1944. He was formerly with the Exchange Trust Company, Exchange National Bank, and the U. S. Engineers.

▸ **J. R. White** was named executive vice president of Imperial Oil Ltd. A graduate of University of Toronto, White entered Imperial's service at Sarnia in 1933 as draughtsman and engineer. He came to the U. S. in 1937 and in 1938 to Standard Oil Company of Venezuela, becoming a vice president of that company in 1942. In 1944 he returned to Imperial Oil and was elected a director and a vice president in 1945.

**H. H. Hewetson** has resigned as a director and chairman of the board of the company. He began his career in the oil industry at Imperial's Sarnia refinery following demobilization from the R.A.F. after World War I. Later he served with various companies in the U. S. and South America and returned to Imperial at Toronto in 1935. He was successively a director, vice president, and president and became chairman of the board in 1949.


Wherever pipes meet, permanently

**IN THE PETROLEUM FIELD,** the right answer to every temperature, pressure and corrosion resistance fittings problem is W-S Screw End and Socket Weld Forged Steel Fittings.

Basic materials are selected from a wide choice of carbon, stainless and alloy steels. Designs are carefully engineered. Fittings are drop forged for strength . . . precision machined for accuracy of finish, and instrument inspected for perfection of threads, sockets, angles and concentricity. Investigate them today.

Write for Bulletin A3-50. For information on Stainless and Alloy Steel Fittings, ask for Bulletin S-1.

SOLD THROUGH LEADING DISTRIBUTORS EVERYWHERE

SPECIFY...

W-S

FORGED STEEL FITTINGS

DISTRIBUTORS PRODUCTS DIVISION, ROSELLE, NEW JERSEY

WATSON-STILLMAN Established 1848

*Designers and Manufacturers of Forged Steel Fittings, Valves, Wire Rope Shears, Hand Pumps, Jacks, Pipe Benders and Hydraulic Equipment*

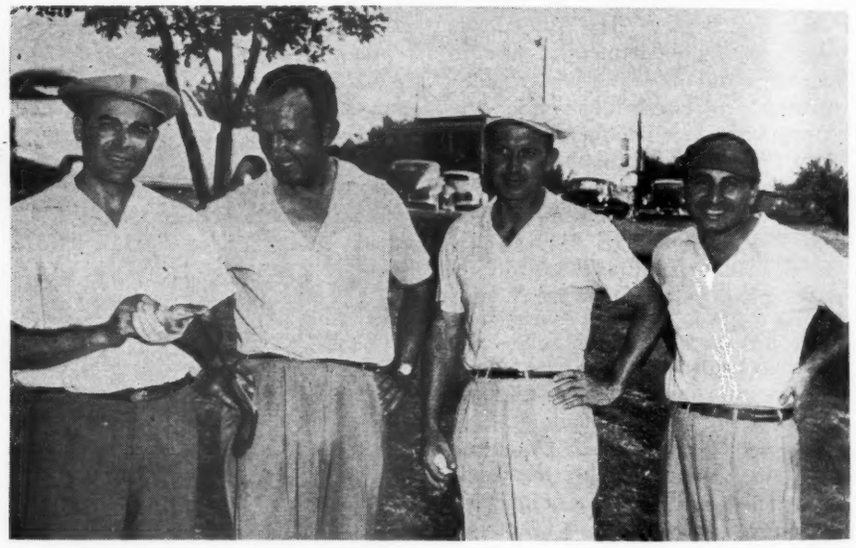
## Dallas Nomads Hold Golf Party

M. W. Hiltpold, The Buda Company, receives a prize from George Stevens, Cummins Engine Company, at the party.

A dinner followed the golf tournament at the Colonial Country Club, Fort Worth. Around the table above are: Guy Williams, Seaboard Oil Company; W. E. Snow and Charles Yager, Texas Pacific Coal and Oil; and Jack Collins, Sun Oil.

Out on the course for the yearly bout are: Nick Chico and Gus Layton, Big West Drilling Company; and Paul Grinnell and Ted Weiner, The Texas Crude Company.

Golf prize is awarded Grover Colwell, Parker Drilling Company, by George Stevens.



Chinning after a big day are: H. E. Bowerman, Grand Prairie Rubber Company; C. W. Zartman, Rector Well Equipment Company; G. C. Waldrop, Grand Prairie Rubber Company; Myel Andrews, and George Milligan, Rector Well Equipment Company; J. R. Richardson, Richardson Machine and Engineering Works; and J. A. Hord, Gulf Oil Corporation.

▸ **E. H. Todd,** vice president of three wholly-owned Standard Oil Company of California eastern subsidiaries, has been named president of one, Calmara Oil Company. Todd was vice president of Calmara before his promotion to the presidency. He is also president of Pocahontas Terminal Corporation, a jointly-owned company with Pocahontas Fuel Company.

Calmara, which has its headquarters in New York City, is engaged in the marketing of crude oil and petroleum products from Venuezuela and crude oil from Saudi Arabia.

Todd, who has worked for California Standard affiliates and subsidiaries for the past 34 years, is also administrative vice president of The California Oil Company and of California Refining Company.

## CLASSIFIED


### ENGINEER WANTED

Engineer—B.S. degree—preferably mechanical engineer with 1 or 2 years pipeline design engineering experience. To work for pipeline company in developing economic and hydraulic studies for proposed lines and stations and to work generally in all phases of pipeline engineering. Occasional travel for short periods. Please indicate interest promptly. Write Box 116, c/o The Petroleum Engineer, P. O. Box 1589, Dallas, Texas.

### PRESSURE VESSEL ENGINEER

Excellent opportunity in internationally known Oil Refinery Company for graduate engineer with heavy experience in design & development. Must be familiar with ASME and API Codes. Knowledge of vessel fabricator's shop practices and metallurgy. Attractive salary, including Pension Plan and other Employee Benefits. Write in strict confidence details of experience & education to Box 115, c/o THE PETROLEUM ENGINEER, P. O. Box 1589, Dallas, Texas.

### CONCRETE DESIGNER

Unusual opening for graduate Civil Engineer in large Engineering Company in N.Y.C. Attractive salary with considerable overtime, liberal pension plan and other employee benefits. Our people know of this opening. Replies will be held in strictest confidence. Write details of education and experience to Box 114, c/o THE PETROLEUM ENGINEER, P. O. Box 1589, Dallas, Texas.


▸ **Fred H. Matthews** was named to the position of manager, crude and products department, Western division, Tide Water Associated Oil Company. In his new position, he will assume the duties and responsibilities carried out by the late **Harry T. Earl,** including the purchases and exchanges of crude oil and products. He will also serve as a member of the Western division operating and production committees.

Fred H. Matthews

A native San Franciscan, Matthews was first employed by the Associated Oil Company as an office boy in 1913. Since then he has had many promotions and has, successively, held a number of positions in the company's transportation department.

▸ **Henry L. O'Brien** has been appointed to the office of general counsel of Cities Service Company and its subsidiaries. An officer and director of the company since 1940, and formerly a partner in the law firm of Frueauff, Burns, O'Brien and Ruch, O'Brien has in recent years supervised the disposition by Cities Service of its electric utility properties, as well as assisting in the recently completed program for simplification of the Cities Service corporate and financial structure.

In his new capacity he will have executive supervision and direction of legal matters pertaining to Cities Service Company and its subsidiaries. In addition to his duties as general counsel, O'Brien will continue as a director of Cities Service Company and various of its subsidiary companies.

▸ **L. B. Harrell** of Waycross, Georgia has been appointed to fill the vacancy on the Oil and Gas Board created by the recent death of **Judge Harry D. Reed,** also of Waycross. The appointment was made by Governor Herman E. Talmadge.

▸ **Ashton J. Mouton** was recently appointed to serve on the Louisiana State Mineral Board. He succeeds **Edgar G. Mouton,** who resigned to accept a position with the Louisiana State Tax Commission. Both men are from Lafayette, Louisiana.


# CUT VAPOR LOSSES

## The Simple, Low Cost Way

Evaporation losses, both breathing and filling, can add up to big money lost in thin air.

Today there is a simple, low-cost method of vapor conservation — the VULCAN BREATHER BALLOON. It is a collapsible and expansible balloon constructed of a special synthetic rubber coated fabric. In a simple installation it is connected to any tank. Escaping vapors flow into and are trapped in the balloon during periods of high temperature, condensing back into the tank at night, or when temperature lowers.

The breather balloon is light, compact, easily and economically shipped. It needs only a simple housing, and will pay for itself quickly in savings.

*Write today for complete illustrated descriptive literature.*

**VULCAN**

**RUBBER PRODUCTS**

INCORPORATED

(Formerly Vulcan Proofing Co.)

First Avenue and 58th Street
Brooklyn 20, New York

# "Withstands Tremendous Shock and Strain Without Breakage"

**Whitney Oil Field Assembly Chain**

The Walker-Neer Spudder is designed for efficiency, versatility and portability. It is specially constructed to provide unusual safety at highway speeds or crossing of rough terrain. It is recommended for drilling up to 5000 ft.

To assure positive power transmission all drums and the spudding mechanism are Whitney Oil Field Assembly Chain driven. Walker-Neer says — "The spudding beams are driven by double chain. *This chain takes a tremendous amount of shock and strain due to the action of the spudding beams and cranks.* . . . The three hoisting drums are driven by a single-width Whitney chain *and pull great loads at very high speeds.*"

Walker-Neer's experience proves that Whitney Oil Field Assembly chains transmit full rated horse-power without slippage. The rugged construction of all chain parts assures long operating life with minimum maintenance under the severest of operating conditions. In addition, the snap-ring design provides positive fastening, makes installation easy. The *offset links* make field adjustments easy.

Regardless of the type of oil field equipment you manufacture, you can keep it on the job working with Whitney Chain Drives. Write for information.

THE WHITNEY OIL COUNTRY WAREHOUSES

**EDWARD D. MALTBY CO., INC.**
**1718 Flower Street,**
**Los Angeles, California**

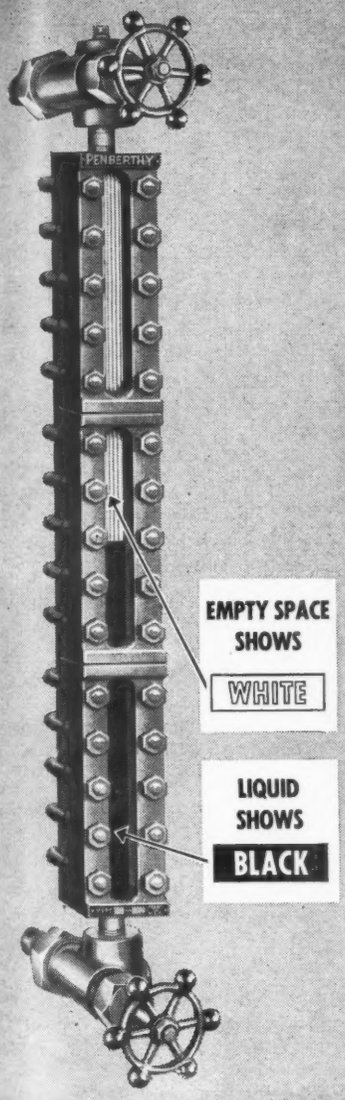
**WHITNEY CHAIN COMPANY**
**2914 Taylor Street,**
**Dallas, Texas**

## WHITNEY CHAIN COMPANY

**217 HAMILTON STREET, HARTFORD 2, CONNECTICUT**

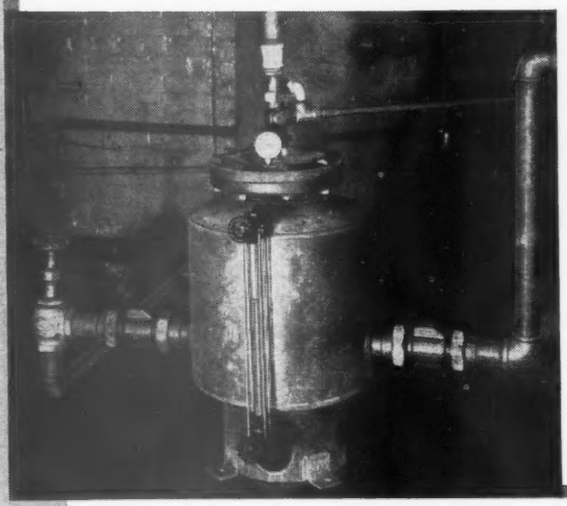
# PENBERTHY PRODUCTS THAT improve PROCESS AND PLANT

## PENBERTHY REFLEX LIQUID LEVEL GAGES




You can't misread the Penberthy Reflex Liquid Level Gage . . . *it prevents mistakes.* Due to a simple, invariable optical principle, the empty space always shows white . . . the liquid black. In addition to standard units, Penberthy Reflex Gages are fabricated to customers' specifications from special alloys to meet unusual corrosive, pressure and temperature conditions. Write for new Catalog No. 35.

## PENBERTHY CYCLING JET PUMPS

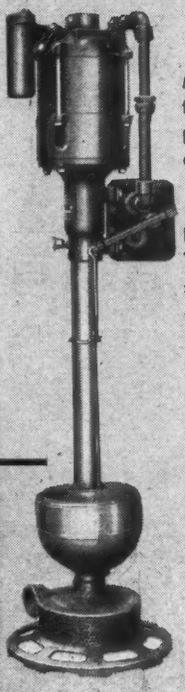


Operated by air, gas, or steam pressure, pumps (without clogging) any liquid that will flow through pipes. Lifts fluid from lower level and discharges against pressure approximately equal to operating gas pressure. Operates automatically by ejector that exhausts the vessel . . . drawing in liquid . . . then gas pressure pushes it out. Ejector and its control valve not in contact with fluid pumped. Corrosion proofing easy. Write for Bulletin 5030.

## PENBERTHY EJECTORS

A simple jet pump operated by air, water or steam. Has no moving parts . . . needs no lubrication. Will not get out of order . . . wear is not appreciable. Reliable, noiseless, compact, convenient and initial cost is very low. Made in bronze, iron and wide variety of materials that successfully withstand corrosion, contamination and high temperatures. Special units developed to meet unusual conditions. Write for Catalog 34.

## PENBERTHY *Explosion Proof* SUMP PUMPS



Motor and switch totally enclosed, this pump has Underwriters approval for Class I, Group D, and Class II, Groups E, F and G hazardous locations. These include gasoline, solvent vapors, metal dust, natural gas, carbon black, naphtha, alcohol, grain dust, acetone, lacquer, coal and coke dust, etc. Made of copper and bronze throughout, this pump is corrosion proof, durable, thoroughly dependable. Write for Bulletin 4929.

PENBERTHY ALSO MANUFACTURES A COMPLETE LINE OF LIQUID LEVEL GAGES IN BRONZE, IRON, STEEL AND ALLOYS

**PENBERTHY INJECTOR COMPANY**

DETROIT 2, MICHIGAN

*Established 1886* — *Canadian Plant, Windsor, Ontario*

4290

# LAUGH WITH BARNEY

She was a hula dancer,
He was a guy from the fleet—
He forgot the sugar he left at home
When she shook her shredded wheat.

* * *

*Anne:* "What makes people walk in their sleep?"

*Nan:* "Two things. Insomnia and twin beds."

* * *

A customs officer, while examing a sailor's baggage, discovered a bottle of whiskey. "I thought you told me there were only night clothes in that suitcase?"

"Right," replied the gob, "that's my night cap."

* * *

The boy and girl were out in the highway when the car broke down. He didn't seem to mind and wanted to make love. "My kisses will put new life in you," he said.

"Then for goodness sakes get out and kiss the car," she replied sweetly.

* * *

A stenographer defines a wolf as a modern dry cleaner. He works fast and leaves no ring.

* * *

*Minister:* Richard, what does father say before each meal?

*Richard:* Go easy on the butter, kids.

A little colored boy was sitting slumped down in his chair with his feet resting on the table when his mammy came in and said: "Lawd, you is a lazy boy; you zackly like yo' pappy. Thank de Lawd I didn't marry dat man!"

* * *

"Sorry, madam, but licenses are issued only when your form is filled out properly."

"Why, I like your nerve, sir. We can get married no matter what I look like."

* * *

*Doctor:* And there's really nothing to worry about that habit of yours of talking to yourself.

*Patient:* Perhaps not, but I'm such a damned bore.

* * *

John O'Grady, full of gin,
At three a.m. came stumbling in.
His wife was large, poor John was small . . .
John's still plastered—on the wall.

* * *

The minister's wife had just died, and wishing a week's leave from his pulpit he wrote his bishop:

"I regret to inform you my wife has died. Please send a substitute for the week-end."

DUNNO' WHAT'S AT 4732 FEET— BUT EVERYTIME WE REACH IT, THE CHART PEN SQUIRTS OIL ALL OVER THE CHART !!
LANE O WELLS
RADIOACTIVITY WELL LOGGING
CR-204

The click of knitting needles, the creak of the rocker and the ticking of grandfather's clock were all that disturbed the silence of the room. With childish curiosity little Ellen sat watching the purls and stitches.

"Why do you knit, grandma?" she asked.

"Oh, just for the hell of it," the old lady replied.

* * *

A hungry Irishman went to a restaurant on Friday and said to the waiter: "Have yez any whale?"

"No."

"Have yez any shark?"

"No."

"All right," said the Irishman. "Then bring me ham and eggs, and a beefsteak smothered with onions. The Lord knows I asked for fish."

* * *

Young man to psychiatrist: "The trouble with me, sir, is that I'm from Texas and ashamed of it."

* * *

A gentleman slipped on the stair of a subway and started to slide down to the bottom. Half-way down he collided with a lady, knocking her down, and the two continued their way together.

After they had reached the bottom, the lady, still dazed, continued to sit on the gentleman's chest. Looking up at her, he said politely, "I'm sorry, madam, but this is as far as I go."

* * *

One morning Brown looked over his garden wall and said to his neighbor: "What are you burying in that hole?"

"Oh," he said, "I'm just replanting some of my garden seeds."

"Seeds—" screamed Brown angrily. "It looks more like one of my hens."

"It is and the garden seeds are inside."

* * *

*Mrs. Brown:* "When my sister was in Europe before the war, she saw a woman hitched to a mule."

*Mrs. Jones:* "That happened at our wedding, too."

* * *

*Bus:* I suppose you heard that poor old Al killed his wife?

*Bud:* No! How?

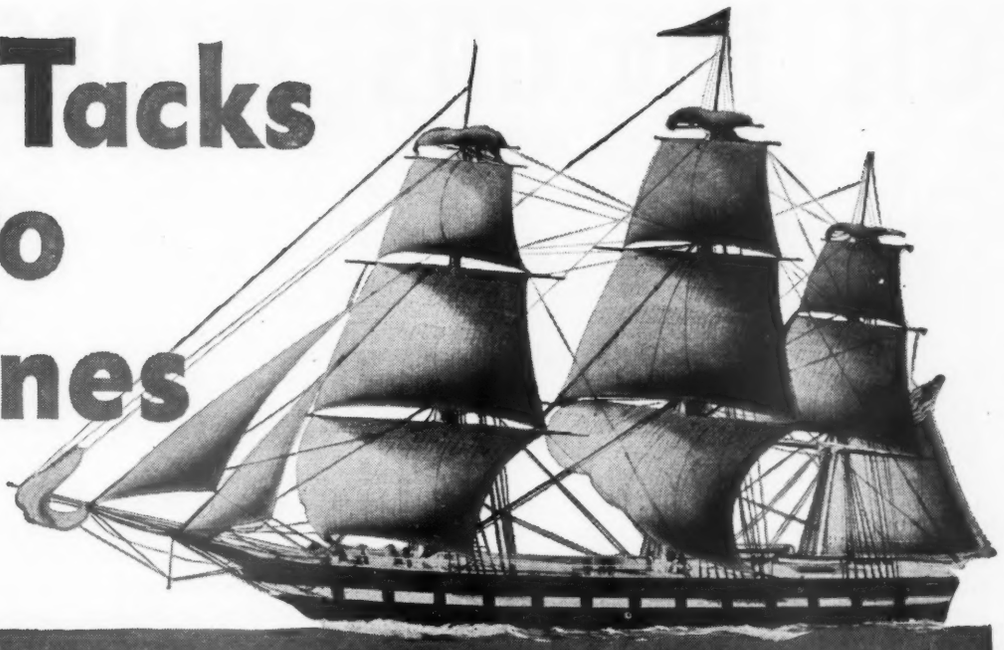
*Bus:* With a golf club.

*Bud:* How many strokes?

* * *

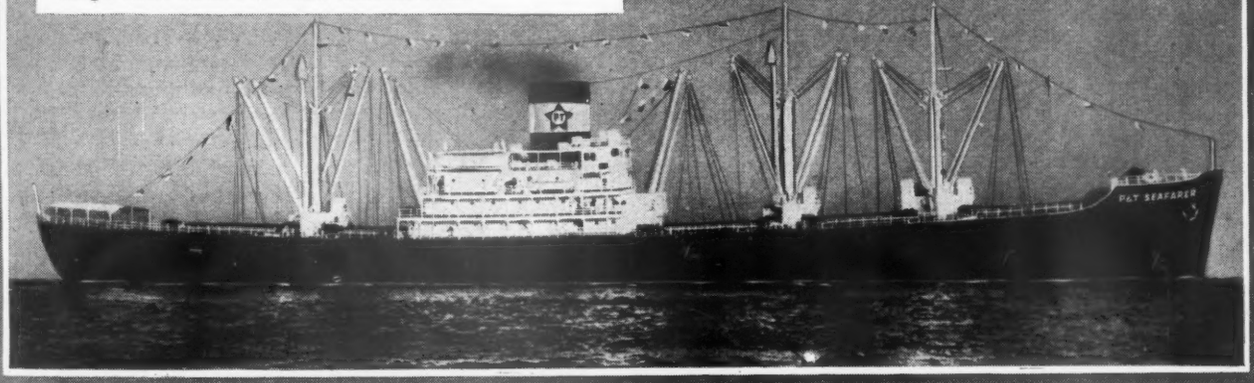
Worry is like a rocking chair. It gives you something to do, but won't get you any place.

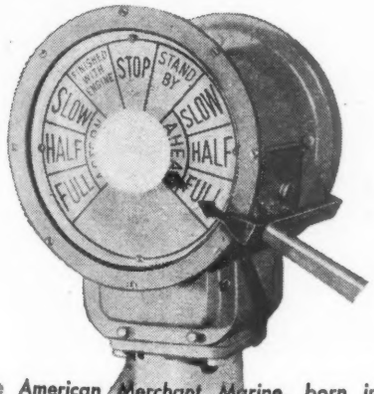
# From Tacks to Turbines



**Petroleum Progress serves the Marine Industry**

Not so long ago sailing ships were at the mercy of wind and weather. Wind-seeking tacks took ships the long way 'round. Today, thanks to petroleum, giant turbines drive passenger and cargo laden ships dead ahead to their destinations.




*The American Merchant Marine, born in 1607, grew to an all-time high in 1945, operating more than 25 million gross tons. Throughout the world, specialized marine fuels and lubricants help maintain this essential, economic lifeline.*

OIL beats the wind! Sails were augmented by paddle wheels and then propellers. Wooden ships were replaced by ships of iron and steel. Huge turbines now furnish power, speed and dependability.

At ports around the world Texaco fuels and lubricants are taken aboard, relied on for economical, efficient, on-schedule operations.

The marine industry has always been a major force in building and defending America. Petroleum research has contributed mightily to this vital maritime network of shipping and transportation.

## THE TEXAS COMPANY

***Petroleum Promotes Progress***

TEXACO REG. T. M.

# OIL AND GAS TRADE NEWS

## New Export Company Formed in Denver

The formation of Eastman International Company, a new organization to handle foreign sales, service, and equipment of the Eastman Oil Well Survey Company has been announced in Denver, Colorado by H. John Eastman, president of the new firm. Eastman International will be the exclusive agents for Eastman equipment world wide. The main office is in Denver, Colorado, with district offices in Long Beach, California, New York City, and Houston, Texas. The Eastman Oil Well Service Company, Ltd. of Calgary and Edmonton, a subsidiary.

Officers of the company include Hal Benson, vice president, and Phyllis M. Freeland, secretary-treasurer. Together with Eastman and Capt. J. E. Treacy, managing director of the Canadian offices, they will comprise the board of directors. David P. Neill is general sales manager. Rudy von Glinski is assistant to the vice president.

## New Plant to Open Soon

Flexible Tubing Corporation will move into its new 13,000 sq ft brick and steel plant in Guilford, Connecticut, on November 15. The company, with plant and office now situated in Branford, manufactures the Spiratube, a ventilating and products-conveyor. Ground was broken for the new modern one-story plant, which was designed by Caproni Associates of New Haven, at a ceremony presided over by Frederick K. Daggett, Flexible Tubing Corporation president and the man responsible for the founding of the company in December, 1947.

## Buys Interest In Atlas

Alvin (Dutch) Zwerneman, who recently resigned as vice president and general sales manager of the Axelson Manufacturing Company, Los Angeles, has just announced his acquisition of a substantial interest in Atlas Pipe, Inc., of Houston, Texas. Zwerneman, who has been a familiar figure throughout the petroleum equipment industry for more than a quarter century, plans to make his home in Texas permanently, and will operate from the Atlas Pipe offices, situated at 1311 Esperson Building in Houston. In addition to the sale of petroleum pipe, the Atlas organization will also represent Rasmussen Manufacturing, Hollydale, California; the E. H. Edwards Company, San Francisco, and Page Oil Tools, Inc., of Long Beach.

Zwerneman was a member of the Petroleum Administration for War in Washington, D. C. during World War II. Long a resident of California, Zwerneman is a native Houstonian.

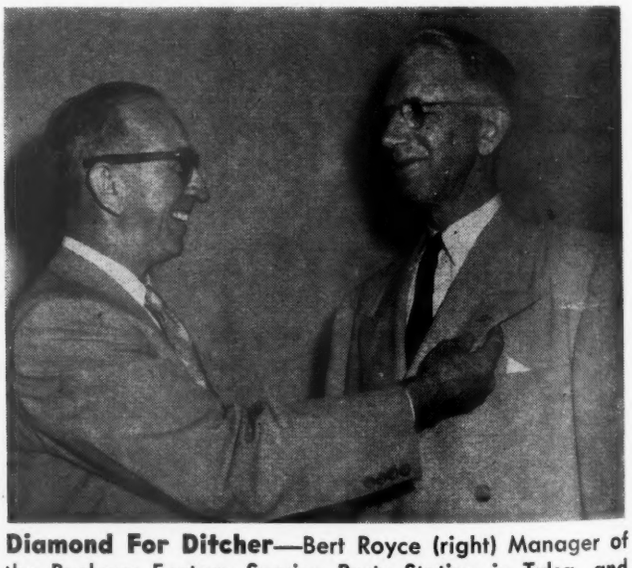
## National Supply Buys Atlas Imperial Company

The National Supply Company, Pittsburgh, Pennsylvania recently purchased assets of the engine division of the Atlas Imperial Diesel Engine Company, Oakland, California. The purchase included the name, patents, trademarks, designs, together with certain machinery and equipment, as well as sales and service outlets and inventories throughout the United States and Canada from Halifax, Nova Scotia south to Houston, Texas on the East and Gulf Coasts, and from Ketchikan, Alaska south to San Diego, California on the West coast. Manufacture of Atlas Imperial diesel engines and parts will be carried on at the Springfield plant.

## Corporate Name Changes

Enterprise Engine and Foundry Company has changed its corporate identity to Enterprise Division, General Metals Corporation, with Paul I. Birchard named vice president and manager. The change became effective upon consolidation of Enterprise with Adel Precision Products, Burbank, California and General Metals Corporation, with California plants in Los Angeles, Oakland, and Houston, Texas. William E. Butts was named president of the new corporation.

H. John Eastman, Rudy von Glinski, and Hal E. Benson form Eastman International.



**Diamond For Ditcher**—Bert Royce (right) Manager of the Buckeye Factory Service Parts Station in Tulsa, and known as the "Dean of Ditchers" throughout the pipe line industry, receives a diamond 40-year service pin from Colonel G. M. Taylor (left), manager of the Findlay division of Gar Wood Industries, Inc. Royce joined the company in 1910, at a time when it was known as the Buckeye Traction Ditcher Company.

## Oilfield Equipment To Be Made in England

Cameron Ironworks Inc., Houston, Texas has granted a manufacturing license to British Oilfield Equipment Company, Ltd., of London and Leeds to produce in England a range of its products for marketing in the sterling areas. The range of equipment covered by this agreement includes: Well head assemblies, casing and tubing heads and hangers, forged steel tees and crosses, chokes and flow wings, tubing packers, blow out preventers, flow line valves, hydraulic operated gate valves, and manual blow out preventers. A Cameron agency agreement, government approved, enables British Oilfield Equipment to market the balance of the range of American oilfield equipment in the sterling areas.

## Pritchard In New York

J. F. Pritchard and Company, of Kansas City, Missouri has formally opened a new district office in the Chrysler Building, New York City, to serve New York, Connecticut, New Jersey, and Eastern Pennsylvania. The office is under the management of A. B. McClelland, Jr., who recently joined the Pritchard organization. Well known in the New England area for his sales engineering work involving the design and construction of plant facilities for the petroleum and chemical process industries, McClelland's recent activities include 9 years as a sales engineer for W. M. Kellogg Company and two years as sales manager for Project Engineering Company.

A. B. McClelland

## Goodrich Offices Moved

Dan Goodrich, advertising, an industrial agency specializing in petroleum equipment advertising, has announced the removal of its offices to 605 Texas Bank Building, Dallas, Texas effective September 15. The firm's new telephone number is RAndolph 6544. Previous offices were at 2619 Cedar Springs Avenue in Dallas.

## Wright Attends AAPG Meet

Kenneth A. Wright, vice president of B & W, Inc., recently attended the American Association of Petroleum Geologists' annual meeting at Lake Banff, Sept. 5 and 8, while on a business trip through the Canadian fields. An old-time member of the Association, Wright said this was one of its most interesting meetings.


ACRAGAGE

Shockstop!

PAT. APPLIED FOR

Protects against Pulsation and Shock!

Eliminates Snubbers – It Can't Plug –

The Most Significant Pressure Gage Development in 50 Years.

For the first time, a successful means of eliminating the effect of pulsation and shock on pressure gage mechanisms has been developed which DOES NOT introduce an orifice or restriction in the pressure connection.

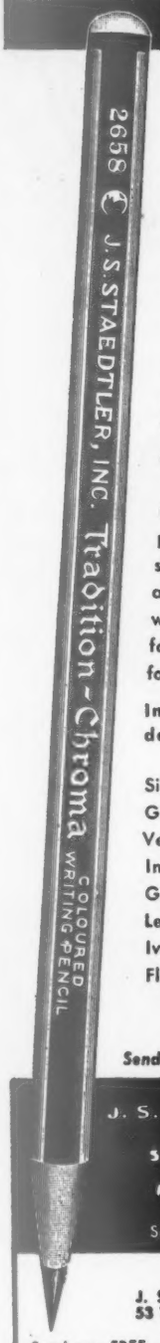
It Can't Plug

FOR COMPLETE INFORMATION, WRITE FOR CATALOG C-50

CLAPP INSTRUMENT CO.

WEBSTER, MASSACHUSETTS

Make Any Comparison!
Tradition Chroma
Color Pencils
have no Equal!




TRADITION CHROMA by Staedtler, inventor of the first colored pencil in 1834, combines the brilliancy of the colored crayon with the strength of the colored copying pencil. Test TRADITION CHROMA yourself. We guarantee you'll like them best.

Sharpen TRADITION CHROMA to a fine or blunt point. Lead will not smudge. The clear, distinct, fadeproof colors are not water soluble.

TRADITION CHROMA is unmatched for checking blue prints, maps, office work, sketching, rendering, and all architectural and engineering work. In addition, there are four colors especially designed for blue print marking.

In 16 vivid colors. If your dealer cannot supply you write us.

| | |
|---|---|
| Silver* | Bishops Lilac |
| Gold* | Mountain Blue |
| Vermilion Red | Chrome Green |
| Indigo Blue | Saturn Orange |
| Grass Green | Chalk White |
| Lemon Yellow | Mouse Grey |
| Ivory Black | Brick Red* |
| Florentine Brown | Zinc Yellow* |

*Especially designed for Blue Print Marking.

*Send coupon today for FREE sample.*

J. S. STAEDTLER, INC.
53 WORTH STREET
NEW YORK 13, N.Y.
STAEDTLER SINCE 1662

PE

J. S. STAEDTLER, INC.
53 Worth Street, New York 13, N. Y.

Send me FREE — a TRADITION CHROMA Colored Pencil (color_____)
Name_____ Title_____
Firm_____
Address_____
City_____ State_____
Dealer's Name_____

## Bost Returns to Army

Armon H. (Jack) Bost, vice president and general manager of the Midwestern Engine and Equipment Company, Inc., Tulsa, Oklahoma recently announced that the United States Army had alerted him and that as of September the 15th he would suspend his duties at that company and be inducted into military service. A nationally recognized reservist leader, Colonel Bost served five and half years in World War II and has since steadily and actively engaged in important peace-time reservist work. In June of this year Bost was considered for a high position in the reserve command in Washington but declined in light of his executive obligations and duties at Midwestern.

A. H. Bost

Jack Bost, O. E. (Ted) Murray, and Jack Glandon were among the original organizers of Midwestern Engine and Equipment in 1946, and later bought out other major stockholders.

## Quimby Division Sold

Quimby Pump Division of H. K. Porter Company, Inc. has been sold to Warren Steam Pump Company, Inc. it was announced in Pittsburgh today by Porter's President, T. M. Evans. Evans explained that the Warren Steam Pump Company, Inc. was well equipped to handle the servicing of Quimby pumps, and Porter was withdrawing from the manufacture of screw pumps, a relatively small business, in order to devote itself more fully to its other lines of business.

## Sees 25th Year of Service

This year marks the 25th year for M. N. Dannenbaum Company, distributors, of Houston, Texas. Founded by M. N. Dannenbaum in 1925, the company originally consisted of its founder and a stenographer. By 1940 a modern office and warehouse facilities had been built and 9 engineers, 4 secretaries, and 1 warehouseman added.

Company personnel consists of Stanley S. William, vice president, and Neal R. Mannon, J. H. Palmer, George F. Norwood, L. L. Dickson, C. C. Camp, Richard T. Nosler, W. L. Coleman, engineers. Secretaries are Mrs. Constance Andrews, Misses Melina Dannenbaum, Bessie G. Gates, and Doris Donnell.

Among the many leading equipment companies Dannenbaum represents through the Gulf Coast area are: Union Iron Works; Terry Steam Turbine; Milton Roy Company; Mixing Equipment, Inc.; Thomas Flexible Coupling; Peerless Pump division, Food Machinery and Chemical Corporation; Barco Manufacturing; Republic Flow Meters; Hammel-Dahl; Chicago Pump; The Briggs Filtration Company; Stets Company; Yarnall-Waring, and the Anders Company.

**New Trademark.** Roger Henquet, left, executive vice president of Schlumberger Well Surveying Corporation, and R. R. Rieke, sales manager, have just placed Schlumberger's new trademark on a field unit for the first time. Designed by Henquet, it features a derrick and the name Schlumberger superimposed on an electrical log.

**BROWN FINTUBE'S *advantages***

**EXTREME FLEXIBILITY**
Easily Adapted to Changes in Duty

**NO OBSOLESCENCE**
Avoiding Waste and Expense

**FLANGED HEAD END ASSEMBLY**
Eliminating Ground Joint Seals

**EASY MAINTENANCE**
Using Only Common Tools

**CONTINUOUS OPERATION**
No Shut-Downs For Cleaning

**REDUCED STORES REQUIREMENT**
Minimizing Investment and Handling

**QUICK DELIVERY**
Only a Few Hours in Emergency

**INCREASED CORROSION ALLOWANCE**
Longer Tube Life

# continuous operation

## Brown Fintube Sectional Exchangers Eliminate Shut-downs for Cleaning Pay Users Extra Dividends

● By simply manifolding an extra parallel stream into the bank, one stream after another can be taken off-line and cleaned, while the exchanger operates at full capacity.

This avoids the necessity of carrying a 100% standby unit to insure continuous operation. It permits the sections to be cleaned as frequently as the duty requires, without effecting other parts of the plant, and assures *clean surfaces* and *efficient* operation, year after year, without shut-down.

For the utmost in efficiency and economy — use Brown's proven, welded fintube heat exchangers throughout your plant. Estimates and quotations furnished promptly. *Write for Bulletin No. 481.*

**THE BROWN FINTUBE CO.**
ELYRIA, OHIO

**SECTIONAL HAIRPIN HEAT EXCHANGERS**

Magnaflux Corporation's new office building in Dallas, Texas. The former one was destroyed by a plane crash.

H. John Eastman, Gordon Jackson, and J. B. Murdoch, Jr., inspect an Eastman single shot instrument.

## Magnaflux In New Office

Magnaflux Corporation has moved into its new office at 2823 Manor Way, Dallas, Texas. The previous office and shop was destroyed by an aircraft crash in Dallas last November. A complete office serving the entire Southwest has now been set up. Included in the new building is an Inspection Laboratory where local inspection work can be done. Magnaflux is also equipped to handle work in the field.

## Chiksan Team in Playoff

Southern California will be represented again at the World's Amateur Soft Ball Association Championships by the Chiksan Company team of Brea, California, runnerup in the world's championship tournament in Portland in 1948. Chiksan represents Southern California by a record of 60 games played and 7 lost during the current season against some of the hottest competition in the Southwest. Last season, Chiksan played 36 games and lost 3. In 1948 it won 29 of the 33 games it played. George Bagsley is Chiksan's team manager.

## Happy Company Opens New Dallas Office

The Happy Company, Tulsa, Oklahoma announces the opening of a Dallas, Texas sales and engineering office. Jack Simpson, sales engineer, is manager of the office, which is situated at 519 Sante Fe Building. Simpson comes from the Tulsa office. He is a graduate engineer from Oklahoma University. He has spent the past four years in the Tulsa office of the Happy Company. The new designs of air cooled, finned tube, radiator type cooling are partly due to him, as he was one of the Happy engineers assigned the job of designing the new cooling-line.

## Flow of Ice Measured

H. John Eastman, president of the Eastman Oil Well Survey Company, Denver, Colorado, received a request from the Juneau ice cap expedition of the American Geographical Society, asking for the use of an Eastman single shot instrument to use in experiments to measure the flow of the ice at different depths in the Juneau Ice Cap. Dr. Henri Bader, research associate at the University of Minnesota and a member of the expedition's party, stated that the project will be performed this year, and that all equipment will be flown to the experiment site.

One of the purposes of the research will be to gather data on ice movement, both in direction and drift. To do this, they propose to drill a hole 600 ft deep in the solid ice and case it with aluminum tubing. When this is completed, they will lower the Eastman single shot instrument, which makes a photographic record of the deviation from vertical and the direction of the bore hole, on a wire line and take readings at predetermined points in the hole. In 1951 the party will again return to the location and re-survey the hole with the same instrument, after which this year's record will be compared to show the direction and rate of movement of the casing at various depths, thus determining the rate of flow and direction in which the ice cap moves at different levels.

## National Supply Company Adds New Products Line

California Division of National Supply Company has been appointed distributors of Raybestos-Manhattan rubber and asbestos products for the California oil fields. This will now provide world-wide distribution of Raybestos-Manhattan oil field products by The National Supply Company. This new California division distributorship will be handled by the West Coast Division Office of Raybestos-Manhattan, Inc., located in San Francisco in charge of Littleton C. Barkley, West Coast Division Sales Manager with Schuyler V. V. Hoffman in charge of the Los Angeles Office covering Southern California.

## Warner Transfers Accounts To C. Wheatley Company

The Warner Lewis Company of Tulsa, Oklahoma has just announced that it will transfer all jobbing and representation of a number of its accounts to the Charles Wheatley Company of Tulsa. The accounts include: Viking Pump Company, rotary pumps, Cedar Falls, Iowa; Ralph N. Brodie Company, petroleum meters, Oakland, California; Morrison Brothers Company, petroleum brass goods, Dubuque, Iowa; Evertite Coupling Company, quick detachable couplers, New York, New York; Chicago Metal Hose Corporation, flexible metal hose, Maywood, Illinois, and Westco, Pomona Pump Company, turbine pumps, St. Louis, Missouri.

In addition to these accounts Warner is turning over all inventory of incidental lines that includes hose, pressure gages, tin ware, buckets, and all equipment pertaining to the bulk plant and service station part of the business. Warner Lewis Company's decision for discontinuing these jobbing accounts that it has represented since 1931, is because of its expanding manufacturing requirements in connection with Excel-So water separators, filters, and calibrating tanks, for both domestic and military service.

## Du Pont Expands Facilities

The Petroleum Chemicals Division of the Du Pont Company has announced that expanded facilities for manufacturing its tetraethyl lead antiknock compounds for gasoline will be in production before the end of the year. The new manufacturing units which are now approaching completion at the company's Chambers Works, Deepwater Point, New Jersey, will raise its capacity for making tetraethyl lead by one-third. Construction of the new equipment originally was begun to make it possible for the company to meet normal expansion of its tetraethyl lead business.

## New Division Set-Up

G. H. Westby, president of the Seismograph Service Corporation, Tulsa, Oklahoma, has announced the addition of gravity and magnetometer service to other geophysical exploration services offered by company and its affiliates. Simultaneously, with this announcement, Westby confirmed the appointment of Richard A. Pohly as manager of the company's newly organized gravity and magnetometer division. Pohly attended Albion College for one year and then entered Michigan University, completing his studies in 1937, at which time he accepted a position in the gravity exploration division of the Shell Oil Company. In 1945 he organized the Global Exploration Company, which he operated until 1947.

R. A. Pohly

## Enamel Coating Used

Replacing the ordinary gray paint job previously used, a deep blue enamel is now being used on all fans and blowers manufactured by the Hartzell Propeller Fan Company, Piqua, Ohio. In line with the current demand for color attraction-value in production plants, the new enamel, it is said, more than triples the protective qualities of the coating against abrasion and most acids and alkalies.

## Chiksan Agents Named

Clifford B. Ives and Company, Narberth, Pennsylvania has been appointed representative for Chiksan Company of Brea, California, in the Philadelphia territory. The Rhodes Controls Company, Baltimore, Maryland, has been appointed to represent Chiksan in the Baltimore area. Both of these territories were covered previously by Chiksan's eastern headquarters in Newark, New Jersey.

Pritchard's *New*

**Type "E" Quintair***

**AIR COOLED HEAT EXCHANGER**

***For Low Cost, Efficient Cooling or Condensing of Liquids, Gases or Vapors***

- Lower Operating Costs
- Higher Efficiency
- Fewer Parts to Assemble
- Lower Maintenance Costs
- Lower Installed Cost
- Many Industrial Uses

Other types of Quintair* units also available to meet your requirements.

**Write for FREE Bulletin No. 11.0.080**

*Registered Trade Name

EQUIPMENT DIVISION

**J.F. Pritchard & Co.**

Dept. No. 82 — 908 Grand Ave., Kansas City 6, Mo.

District Offices:
CHICAGO • HOUSTON • NEW YORK • PITTSBURGH • TULSA • ST. LOUIS
Representatives in Principal Cities from Coast to Coast

# FAST ON-THE-SPOT REPAIRS

## *With This Portable Welder!*

This inexpensive "Lincwelder", made by Lincoln Electric Co., Cleveland, O., is easily mounted on running gear or truck for welding service anywhere.

**Welding at the breakdown-scene . . . adds up to savings in time and labor with this light but rugged 180 amp. Lincoln Welder, powered by a two-cylinder Wisconsin Heavy-Duty Air-Cooled Engine.**

**The performance satisfaction of Wisconsin Engine power increases not only the reliability of equipment in all fields, but also increases the confidence of both equipment user and builder. They're sold on such features as self-cleaning, thrust-absorbing Timken tapered roller bearings at both ends of the crankshaft . . . fool-proof air-cooling, from sub-zero to 140°F . . . an easily serviced OUTSIDE rotary type, high tension magneto with impulse coupling, for quickest any-weather starts . . . plus heavy-duty construction, inside and out.**

**Your investigation is invited! 3 to 30 hp., 4-cycle single-cylinder, 2-cylinder, and V-type 4-cylinder models.**

**WISCONSIN MOTOR Corporation**
**MILWAUKEE 46, WISCONSIN**
*World's Largest Builders of Heavy-Duty Air-Cooled Engines*

*WRITE TO HARLEY SALES CO.*
510 ATLAS BUILDING, TULSA, OKLAHOMA
M & M BUILDING, HOUSTON, TEXAS
505 SOUTH MAIN ST., WICHITA, KANSAS
OIL FIELD DISTRIBUTORS FOR WISCONSIN ENGINES AND ALL TYPES OF UTILITY UNITS.

# TRADE PERSONALS

**Alan J. Bronold** was named sales manager for Sterling Electric Motors, Inc. He will take over the duties of **Allen Adams,** who for a number of years has headed Sterling's international and domestic sales organization, and due to illness is stepping down from active sales management, but will continue on as an officer and secretary-treasurer of the company. Bronold was associated with the Vacuum Oil Company prior to 1926. He has been associated with the Westinghouse Electric Corporation since that time, having served in a number of sales and executive capacities.

A. J. Bronold

**Walter C. Anderson,** director of construction materials sales for American Steel & Wire Company's eastern district, has been appointed assistant manager of construction materials products sales division. **Earl N. Graf,** director of wire rope sales for the eastern district, has been named assistant manager of wire rope products sales division. Both men will maintain their headquarters at the company's general sales offices in Cleveland, Ohio. A native of Brooklyn, New York, Anderson received his education there and began as an office boy with the Wire Company's New York sales district in 1921. Graf joined the company's general sales department offices in Cleveland in 1946 as a sales engineer in the wire rope and construction materials division.

**Thomas A. Cleary, Sr.** has been appointed general superintendent of the Campbell Works steel plant and Struthers works of The Youngstown Sheet and Tube Company. He succeeds **William H. Yeckley** who recently was appointed as assistant to the vice president in charge of operations. Cleary is a native of Sharon, Pennsylvania, attended public schools there, and began working at the age of 15 as a weighmaster for Carnegie Steel Company, now a part of the Carnegie-Illinois Steel Corporation. Early in 1915 Cleary joined Brier Hill Steel Company of Youngstown as a laborer in the open hearth department. This company was purchased by The Youngstown Sheet and Tube Company eight years later.

**Donald M. Russell,** director of accounting and assistant treasurer of The Four Wheel Drive Auto Company, has been elected a director of each of the company's two subsidiaries, The Eagle Manufacturing Company of Appleton, Wisconsin, and The Four Wheel Drive Auto Company, Limited, Kitchener, Ontario, Canada, FWD officials have announced. Russell was elected to the two directorships by the boards of directors of the two companies. Russell has been with the Clintonville Company since 1916. He was named manager of the FWD Accounting Department in 1920.

**Roy W. Maze** has been promoted to merchandising sales manager of The Marley Company, Inc., it was announced by **L. A. Christensen,** general sales manager. The company, with general offices in Kansas City, Kansas is the world's largest producer of water cooling equipment. A native of Kansas City, Kansas, Maze received his A.B. degree from the College of Emporia and a M.S. from Kansas State College. Following college, he spent five years teaching and in administrative work in high schools. In 1942 he joined the engineering department of the Aireon Corporation.

R. W. Maze

**Lester E. Reeve** has joined Mack Trucks, Inc., as special assistant on financial matters to E. D. Bransome, chairman and president. Reeve, a graduate of Dartmouth College, was formerly with Lazard Freres and Company.

Olive Dorroh

**Olive Dorroh** was named sales manager of Petroleum Distributing Company, Houston, Texas. He has been in the general oil field supply business for the past 25 years and fully understands the field man's problems. His duties are to coordinate sales and services of the 18 Petroleum Distributing Company branch warehouses that thoroughly cover the active oil fields.

**E. D. (Pat) Casseday,** the Bridgeport Brass Company, has been appointed Houston district sales manager to succeed **George Chatneuff.** Casseday was recently with Bridgeport's Los Angeles, California office. He has been connected with the copper and brass industry for the past 15 years, with experience in both the condenser and heat exchanger field, as well as in plumbing and heating.

E. D. Casseday

**Frank B. Rackley,** formerly executive vice president of the Jessop Steel Company, Washington, Pennsylvania, was elected president of the company. At the age of 33, he is the youngest president of a steel producing company in the United States. Rackley joined the Jessop Steel Company in June 1948, as general manager of sales. Prior to joining Jessop Steel, Rackley was manager of stainless sales for the Western area of the Carnegie Illinois Steel Corporation.

**R. H. Cramer,** general manager of the Hyatt Bearings Division of General Motors Corporation, Harrison, New Jersey, has announced the following changes in the Hyatt executive group. **Alton H. Lundius** has been appointed works manager in charge of all manufacturing and service operations at the Harrison and Clark Township plants. **Robert R. Guempel** has been appointed plant manager of the Clark Township plant. **William H. Chapman** has been appointed director of engineering to coordinate machine and product design, research and application engineering. **Martin A. Moore** has been appointed administrative assistant to the General Manager. **David A. Caminez** has been appointed divisional comptroller.

Lundius joined Hyatt in 1935 as a tool designer. Guempel, who replaces Lundius as plant manager of the Clark Township Plant, came to Hyatt in 1929 as a project engineer. Chapman, of Glen Ridge, joined Hyatt in 1922 as a foreman in charge of race grinding. He has had varied engineering and manufacturing experience. Moore, who is a Short Hills, New Jersey resident, has been with Hyatt since 1915. He has been divisional comptroller since 1928 and is being promoted from that function to his new position. Caminez, of New York City, who replaced Moore as division comptroller, joined Hyatt in 1929 as an accountant.

# Why the FIRST names in pipelines depend on the FIRST* name in line pipe

*FIRSTS by A. O. SMITH • Welded line pipe • Internal expanded pipe • Light wall large diameter pipe • World's largest producer of large diameter welded steel line pipe

"Straight as a die" can be taken literally when oil men discuss A. O. Smith Line Pipe. That's because A.O. Smith's internal expanding process stresses the pipe beyond its yield point—and when pipe is stressed beyond its yield point by uniform internal expansion it automatically comes out round, straight, and consistently of the right diameter.

Uniformly round, straight pipe eliminates time-consuming "line-up" operations in the field and makes possible consistent "stringer bead" welds.

In addition, the A. O. Smith expanding process produces pipe of high yield strength permitting higher operating pressures without the use of alloy steels and their accompanying special welding practices. No wonder the *first* names in pipelines depend on the *first* name in line pipe!

*A. O. Smith Line Pipe is available in a complete range of sizes and wall thicknesses, from 8⅝ in. to 36 in. in diameter.*

A.O. SMITH WORLD'S FIRST 76th ANNIVERSARY 1874 1950

**A.O.Smith**

LINE PIPE • CASING

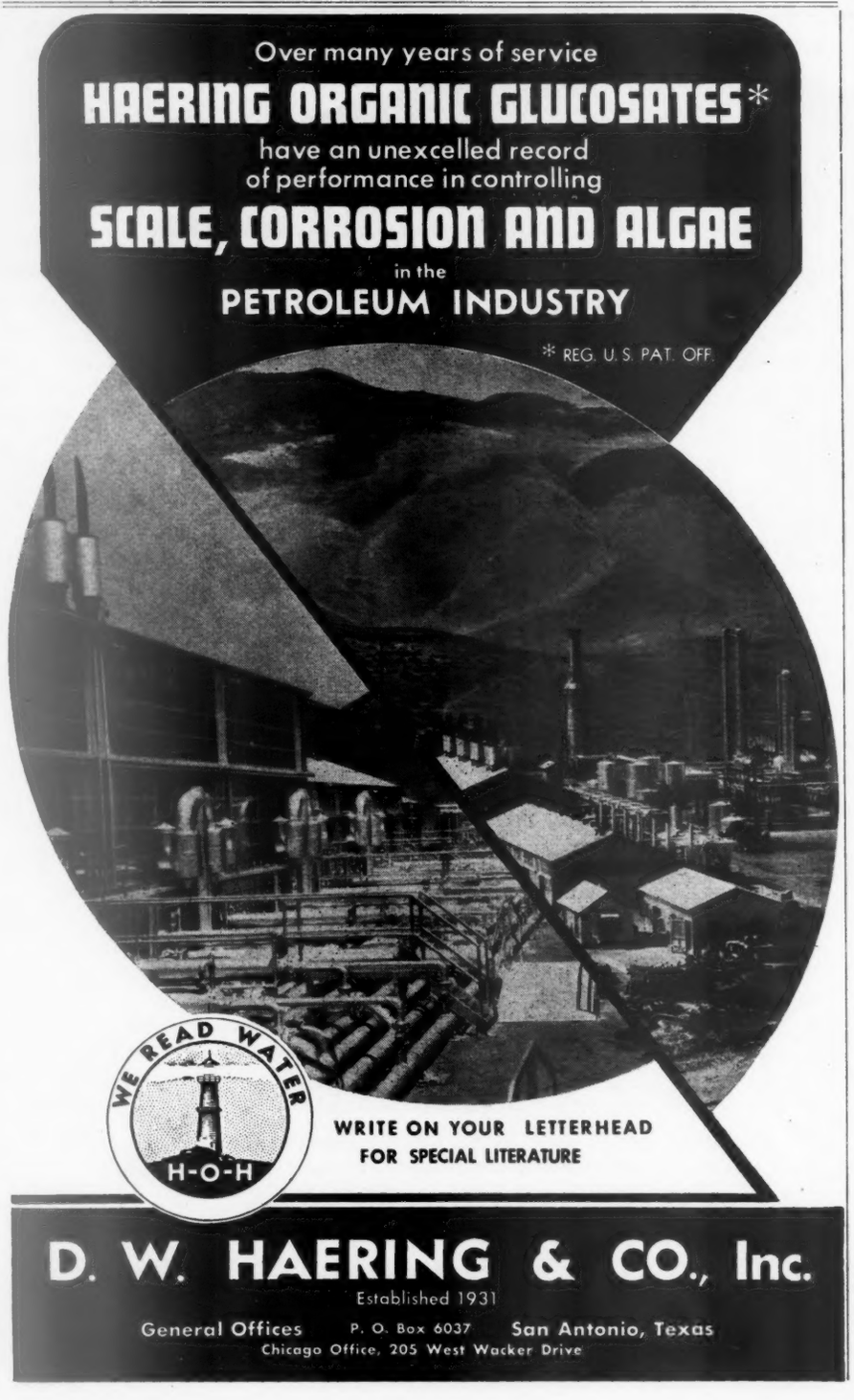
Atlanta 3 • Chicago 4 • Dallas 2 • Denver 2 • Houston 2
Los Angeles 14 • New York 17 • Pittsburgh 19 • Salt Lake City 1 • San Francisco 4 • Seattle 1
Tulsa 3 • Washington 6, D.C. • International Division: P.O. Box 2023, Milwaukee 1

**DEPENDABILITY *through* RESEARCH *and* ENGINEERING**

▸ **R. A. "Dick" Dobbins,** Technical Oil Tool, Inc., has been appointed sales representative in the Cody, Wyoming area. He replaces **P. T. Bannerman** who was recently transferred to Bakersfield, California. Dobbins has worked for more than 9 years in the oil fields, and is well acquainted in the Cody area, having been employed by both drilling and producing companies near there for the past several years.

▸ **Thad Randolph,** sales manager of Oil Base, Inc., has been appointed to a vice presidency, it has been announced by George Miller, president. Randolph will retain his duties as director of sales for Black Magic, White Magic, mud conditioning materials, mud gums, and all products manufactured by Oil Base, Inc. He succeeds **J. A. Moore,** who has resigned from active participation. Moore will remain on the board of directors at Oil Base, Inc.

▸ **John B. Taylor, Jr.** has been appointed assistant director of research at the Ethyl Corporation laboratories in Detroit, Michigan to direct research on automotive and aviation products. Taylor is a graduate of Virginia Military Institute. He joined Ethyl 19 years ago as a field engineer.



▸ **Charles Buford Caldwell,** a young Texan who was associated with the Hughes Tool Company for 18 years, is the new president of Harrisburg Sales and Service, Inc., Houston, Texas. A native of Vernon, Texas, Caldwell finished Amarillo Junior College in 1934, and for the following three years studied mechanical engineering at Rice Institute. He joined Hughes Tool Company at Houston in 1937, and advanced steadily with that firm until resigning to accept the presidency of Harrisburg.

C. B. Caldwell

From 1937 until November of 1947, he was employed as a field salesman—first in Hays, Kansas; next in Oklahoma City, and finally in Ardmore, Oklahoma. In December, 1948 he was transferred to Dallas, where he served as a special sales representative until the summer of 1950. During his stay in Dallas, he was an active member of the Dallas-Fort Worth Chapter of NOMADS.

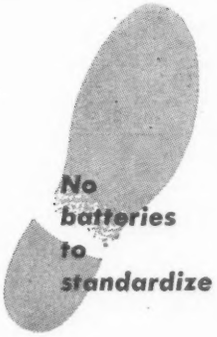
▸ **E. H. Henderson** has been elected vice president of Rosson-Richards Company, Inc., and Rosson-Richards Processing Company, Inc. Henderson was formerly executive vice president of Commercial State Bank, Sinton, Texas.

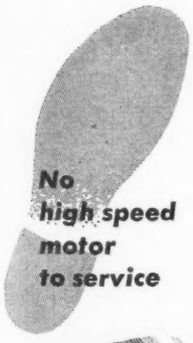
▸ **Atwood Austin,** Kaiser Steel Corporation, formerly financial consultant for several of the Kaiser companies, has been appointed vice president and treasurer of the steel firm. **C. F. Borden,** general sales manager of Kaiser Steel since 1947, was named vice president in charge of sales. Austin served in management capacities with manufacturing firms in Pittsburgh and Detroit before joining the Kaiser organization in 1946. Borden has been in steel sales most of his business career. He was with Columbia Steel and Geneva Steel Corporation before joining Kaiser in 1945.

▸ **Warde Evans,** special traffic representative, Baroid Sales Division of National Lead Company, died in Los Angeles, California recently. Joining Baroid in August of 1929, he was one of the company's first service engineers, and was appointed special traffic representative in August of 1947. He retired in March of this year. Warde and his stories had become, during his lifetime, almost a legend in the industry and his exploits as a horseman and mud engineer will be told and retold for years to come.

# Save three BIG maintenance steps

# with DYNALOGS*



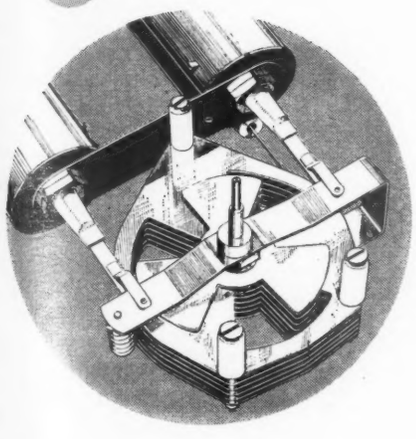




Multiply this saving of maintenance steps by all the instruments you normally service in a year, and you can quickly see the tremendous savings possible through the use of Foxboro Dynalogs.

Through advanced use of electronic principles, Dynalog Instruments have no fast-moving parts, gears, cables, batteries, or high speed balancing motors. In the entire balancing mechanism, there are only four moving parts (none moving faster than the pen). The result is a simpler, sturdier, more dependable instrument that needs practically no maintenance.

*Freedom from maintenance* is only one of many important advantages of Dynalog Instruments. They're superior in: *speed* that's full scale to new balance in as little as one second . . . *sensitivity*, one ten-thousandth of scale . . . *accuracy*, ¼ of 1% of scale. Available for measurement and control of temperature (with resistance bulbs or thermocouples), humidity, pressure, flow, force, pH, conductivity, etc. Write for complete Bulletin 427-1. **The Foxboro Company, 130 Neponset Avenue, Foxboro, Mass., U. S. A.**

*REG. U. S. PAT. OFF.



## The heart of Dynalog superiority

It's a simple variable capacitor! Taking the place of the conventional slidewire, this important component gives Dynalog Instruments absolutely STEPLESS, continuous balancing. It gives you an instrument of extreme accuracy and stability, with a sturdiness that withstands the most severe industrial conditions, *as proved by thousands of installations throughout industry.*

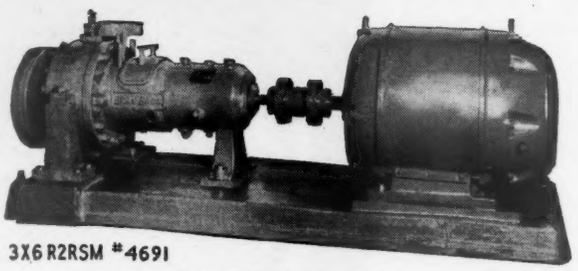
**FOXBORO DYNALOG***

Reg. U. S. Pat. Off.

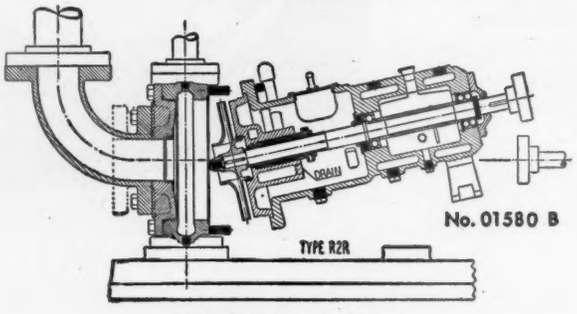
***The electronic potentiometer that has NO SLIDEWIRE***

# DEAN BROTHERS PUMPS INC.

## Type R2R Centrifugal Process Pumps




Type R2R Process Pump




Type R2R Process Pump

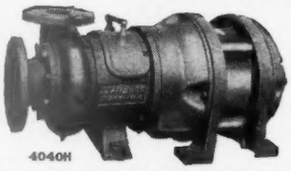
**DISASSEMBLY:** The Type R2R process pumps can be disassembled without disconnecting the suction and discharge piping. By first removing the spacer from the spacer type coupling, and unbolting the casing from the cradle the entire cradle and complete rotating element can be removed without disturbing the suction and discharge piping.

**OPERATING RANGE;** Type R2R, Heavy duty, process pumps are available in eighteen different sizes, enabling our engineers to furnish units specially designed and constructed for the particular work to be performed.

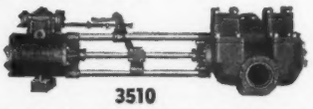
Capacities: 50 to 2000 Gallons per minute. Heads: Up to 400'. Speeds: 900 RPM to 4000 RPM.

*BUILDERS OF OUTSTANDING PUMPS SINCE 1869*

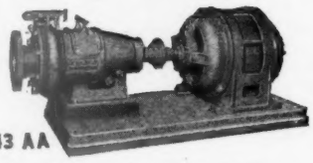
**CENTRIFUGAL and RECIPROCATING PUMPS**



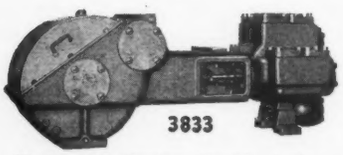

Close Coupled Centrifugal Pump



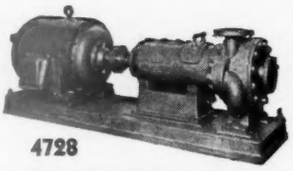

Horizontal, Single Style, Double Acting, Piston Type, Close Clearance Pump. Designed to handle volatile liquids



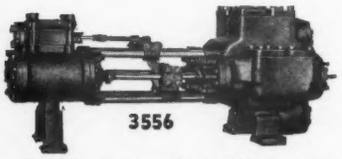

Pedestal Mounted Centrifugal Pump




Horizontal, Duplex, Double Acting, Side Pot, Piston Type, Oil Bath Power Pump




Double Pedestal Bearing Centrifugal Pump




Durable Duplex Packed Piston Pattern Steam Pump, Side Pot Type

*ESTABLISHED 1869*

**DEAN BROTHERS PUMPS INC.**

*INDIANAPOLIS IND.*

*323 W TENTH ST.*

*Branch Offices:* NEW YORK, N. Y., HOUSTON, TEXAS

**Representatives in Principal Cities**


▸ **Sidney B. Iverson,** 42, Tulsa, Oklahoma supply firm official was found dead in his hotel room at Midland, Texas recently. Relatives said he apparently died of a heart attack in his sleep. Iverson, vice president of the Iverson Supply Company was in Midland on business at one of the company's 7 branch offices. He was educated in the public schools and later attended the University of Oklahoma. In 1928 he joined the supply firm, then known as the Iverson Tool Company.

S. B. Iverson

▸ **Glen Peters,** assistant to the general sales manager, Fluid Packed Pump Company, Los Nietos, California, has moved his office from Oklahoma City, Oklahoma, to Fort Worth, Texas. **B. G. Wing,** formerly of Ardmore, Oklahoma, is now manager of eastern division at Olney, Illinois, and **D. A. McDaniels,** formerly of Wichita Falls, Texas, is now manager over North Texas, West Texas, New Mexico, and the Panhandle. District representative **Grady Jennings** has been transferred from El Dorado, Arkansas, to Seminole, Oklahoma. A new employee, **C. C. Hignight,** assumes the El Dorado post. **M. W. Curtis** has been employed to assist **G. R. Newbolt,** division manager of Oklahoma and Kansas. **Harold Palmer,** formerly district sales manager at Kilgore, Texas has been promoted to assistant to **C. D. Newbolt,** division manager over Gulf Coast, East Texas, Louisiana, Mississippi, and Arkansas.

Two additions have been made to the Southwest Texas sales force for Fluid Packed Pump Company. **Denver Hopkins,** formerly of Republic Supply Company, is now at Hebbronville, Texas, and **Frank Quattrini,** a new man with the company, is stationed at Sundown, Texas. Another new field salesman is **J. A. St. John,** formerly of Ibex Petroleum Company, who is at Breckenridge, Texas. **T. K. Weller,** formerly of Republic Supply is at Kilgore. Field salesman **William H. Price** has been transferred from Santa Maria, California, to Russell, Texas. **Walter C. Dobbs, Jr.,** formerly with Eastman Oil Survey, is field salesman at Wichita Falls. **M. C. Watkins,** formerly with The Texas Company at Electra, Texas, is field salesman at Hobbs, New Mexico. **L. E. Loudermilk,** formerly with the National Supply Company at Caracas, Venezuela is now field salesman at Edmonton, Alberta, Canada.

# The New Alfco Model 350

## INDUSTRY'S BIGGEST WHEELED PORTABLE

# DRY CHEMICAL ENGINE

It is one of the most efficient, fast-acting, fire extinguishing units which Alfco engineers have yet devised. Containing 350 lbs. of Alfco Dry Chemical, the smothering action of its deadly discharge on fire is sensational.

Blistering hot fires of considerable proportions which at first may appear too monstrous for control, can be quickly extinguished.

Its discharge pattern is fan shaped. The density of the dispersion of the Dry Chemical is total! Effective range is 20 to 25 ft. Expelling agent is *dry* nitrogen. Discharge time is about 1 min., 15 sec. Dry Chemical is nontoxic, noncorrosive, a nonconductor of electricity and will not freeze.

Approved by Underwriters and Factory Mutual Laboratories. Rating B, C.

*Write for illustrated literature*

OUR 2nd Century of Leadership in FIRE PROTECTION

AMERICAN-LAFRANCE-FOAMITE Corporation

ELMIRA · NEW YORK · U.S.A.

ALFCO

▸ **W. H. Schneider** has been elected vice president-comptroller of Mack Trucks, Inc. He succeeds **J. E. Savacool,** who is retiring. Schneider was also elected a member of the board of directors. Assistant comptroller of Mack since 1943, Schneider served as treasurer of Willys-Overland Company from 1941 to 1943, and was a vice president of the Toledo Trust Company from 1932 to 1941. Previously he was associated with Ernst & Ernst, certified public accountants. Savacool, who joined the Mack Company as a cashier in 1913, rose to comptroller in 1918 and has held that position since.

W. H. Schneider

▸ **Kenneth W. Lineberry** was recently elected president of Black, Sivalls and Bryson, Inc., following the resignation of **A. J. Smith,** former president and director of the company. Lineberry has been a member of the board of directors since 1946 and has been serving as chief executive for the past few weeks. He has announced his resignation as vice president and director of F. S. Yantis and Company, Chicago, Illinois.

▸ **C. N. Sugden** has been appointed assistant director of engineering for gages and instruments, Manning, Maxwell and Moore, Inc. **Robert Ingham,** succeeds Sugden, former chief engineer for gages. **Harry S. Moore** was named director of engineering and development. Sugden joined the company in 1920 in the drafting department and, in 1929, was made chief draftsman. In 1934, he was placed in charge of planning, becoming chief engineer for gages in 1938. Ingham joined the company in 1941 as a development engineer. Previously, he had been an instructor of mechanics in National Defense Training.

▸ **John C. Coonley** has been appointed manager of American Car and Foundry Company's valve division, succeeding **W. R. Kottsieper** who is retiring after more than 44 years of service with ACF. He will continue to make his headquarters in Detroit, Michigan.

▸ **Frank L. Bruckner** has been elected vice president and secretary of Maloney-Crawford Tank and Manufacturing Company of Tulsa, Oklahoma. Connected with the petroleum industry since 1926, Bruckner takes the position of **J. C. Highfill** who retired August 1.

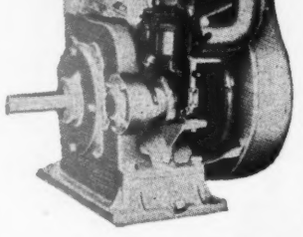
W. H. Huey

▸ **W. H. Huey,** formerly assistant district manager of Oklahoma for United Supply and Manufacturing Company, has been appointed manager of the Dallas, Texas office. Huey's former headquarters were at Pauls Valley, Oklahoma.

▸ **J. J. Bohmrich,** former manager of the product service division of A. O. Smith Corporation, Milwaukee, Wisconsin, has been named grouped executive over the product service, railroad products and welding electrode and equipment divisions. Replacing Bohmrich as manager of product service is **J. W. Spoor,** former assistant manager. In his new position as division manager he will also direct operations of the Chicago product service branch. **E. R. Dickinson,** who has been manager of the Chicago branch, is being transferred to the Eastern branch at Union, New Jersey, as manager, succeeding **C. L. Tracey** who is moving to the New York district office. At the Dallas branch, **J. A. Snyder, Jr.,** was named manager, succeeding **D. R. Neff,** resigned.


# WISCONSIN *Air Cooled*

## HEAVY DUTY OIL FIELD ENGINES



*Standard AFH-AGH-AHH*

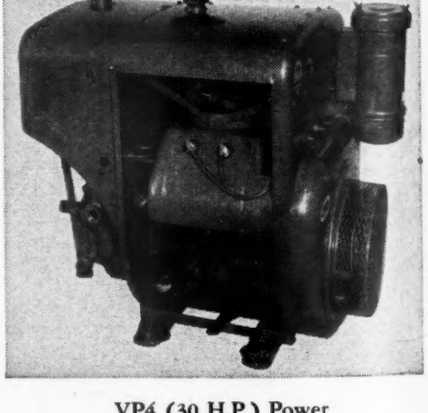
•

Availability of service parts in all oil fields.

•

SPECIFIED BECAUSE

1. Greatest freedom from cooling chores and troubles. More Service FROM the engine, less service TO the engine; fewer Man-Hours lost; more H. P. Hours on the job.
2. Most efficient cooling at all engine speeds and all temperatures, from sub-zero to tropical highs. The engine never runs out of AIR!
3. Lowest maintenance cost. Integrally cast flywheel fan eliminates all cooling "accessories" . . . nothing to get out of order, wear out, or require replacement.
4. Lighter engine weight and greater compactness . . . for most convenient portability and greatest installation adaptability as power components on original equipment.
5. Since nearly a million and a half of these engines have been manufactured in recent years, their satisfactory performance has been proven. According to U. S. Dept. of Commerce 71.6 per cent of all engines manufactured in 1947 in the class 15 H. P. to 22 H. P. were Wisconsins.



VP4 (30 H.P.) Power Unit with Clutch

# HARLEY SALES CO.

*OIL FIELD DISTRIBUTOR*

HOUSTON TULSA WICHITA

# Machinery and Equipment

## New! Improved! Needed!

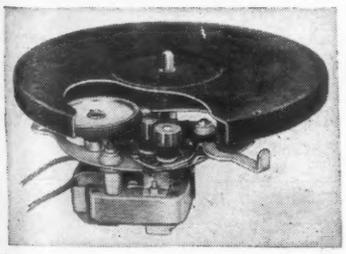
### (1) Water Treatment

Boiler feed water can now be treated by a new system known as the Hot-Z, which combines the advantages of both the hot process and the zeolite process, according to an announcement by Worthington Pump and Machinery Corporation, Harrison, New Jersey.

The development of a styrene base resinous zeolite suitable for operation on hot treated water makes it possible to combine hot process treatment with its deaerating and silica reduction features with zeolite softening, which assures uniform hardness reduction to 0.2 ppm without addition of excess sodium alkalinity. The temporary hardness is removed by lime and zeolite treatment, and the zeolite removes the permanent hardness. This in effect substitutes the zeolite salt regenerant for the more expensive soda ash customarily employed for removal of permanent hardness in hot process softeners.

### (2) Electric Phonodrives

An improved line of electric phonodrives is being currently introduced to the trade by Russell Electric Co., motor division of Raytheon Manufacturing Co., Chicago, Illinois. Featuring a "cat's-paw" tangent-contact drive, resulting in unusually smooth, positive



operation, the new line consists of three models, comprising a three-speed unit, Model DTP, to operate at 78, 45, or 33-1/3 rpm; and two units, Models DSP (De Luxe) and ESP (Economy) at 78 rpm only. The manufacturer reports the new "cat's-paw" Raytheon phonodrives achieve a minimum of background noise and extremely reliable operation, yet the price schedule announced will enable phonograph manufacturers to meet the demands of a competitive market.

### (3) Rotary Pump

A new 300 gpm pump has been added to the 3600 series of Roper rotary pumps, manufactured by George D. Roper Corp., Rockford, Illinois. Designed as the 3600 HBRV No. 7, it is rated at 300 gpm at 360 rpm, and may be driven by geared head motor, gasoline engine, or truck power takeoff. This pump has the venturi suction and discharge principle which spreads the liquid over wide helical gears for smooth flow and high efficiency. The pumping elements, hardened alloy iron helical gears, are fully supported on both sides by bronze sleeve bearings. The steel shafts are induction hardened at all bearing and packing surfaces. A lantern ring in packing box reduces pressure on packing for long-lived, effective sealing. Drain-back from lantern ring automatically reverses if pump rotation is changed.

### (4) Time Selector

A new drilling time selector has been added to the Log-O-Graf for the benefit of geologists and engineers that plot 5-ft and 10-ft intervals of drilling time on sample logs, Warren Automatic Tool Company has stated. A new scale selector has also been added whereby the instrument will now record on one inch to the 100 ft, in addition to two and five inches to the 100 ft. With scale selector set on one inch and time selector set on five feet, the instrument will automatically plot a graph that can be correlated directly with sample logs.

During the drilling of either 5 or 10-ft intervals, the stylus momentarily engages the chart at the completion of each foot drilled, and when the selected interval has been drilled the stylus will engage the chart and mark a horizontal line back to its normal zero position, the company stated.

*These are very brief descriptions of new items manufacturers have put on the market but you need more information to appreciate advance in design, materials, performance, etc. Send the coupon below for details.*

*Get Full Details of October, 1950, Listing—Circle Figures and Mail Coupon to*

**THE PETROLEUM ENGINEER**

**P. O. Box 1589, Dallas, Texas**

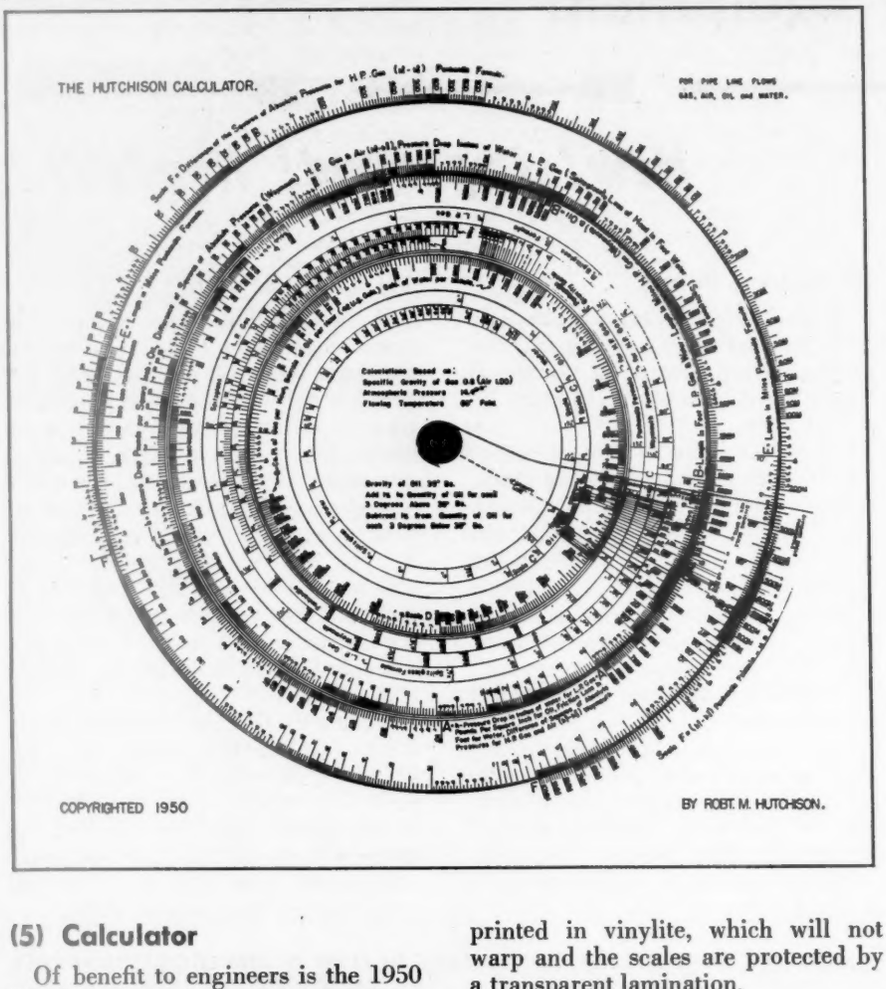
| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | | |
| 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | | |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | | |

NAME ..... TITLE .....

COMPANY NAME .....

STREET ADDRESS .....

CITY ..... ZONE NO. ..... STATE .....




## (5) Calculator

Of benefit to engineers is the 1950 Hutchison calculator, which has been improved according to the manufacturer, Robert M. Hutchison, Houston, Texas. It is printed in two colors and the gas scales have been separated from the oil and water. A scale arrangement can be seen on the accompanying sketch. High pressure gas problems can be calculated by using either the Panhandle or Weymouth formula, while for low pressure gas and water the Spitzglass formula has been used. Problems for oil flow are solved by the use of the National Transit formula. The calculator is printed in vinylite, which will not warp and the scales are protected by a transparent lamination.

## (6) Stainless Steel Valves

Pacific Valves, Inc., Long Beach, California, announces the addition of a new line of stainless steel valves to their regular line of cast-steel valves.

These valves have wide usage in refineries, chemical plants and other industries where handling corrosive fluids, atmospheric corrosion, or metal contamination is a problem. Their new line of stainless steel valves include: 150 lb bolted valves, 150 lb swing check valves, and 150 lb inside screw gate valve.

## (7) Centrifugal Pumps

A new line of self-priming centrifugal pumps has been announced by Gilbert and Barker Manufacturing Company of West Springfield, Massachusetts. Its new Roto-Prime pumps are said to have all the advantages of a centrifugal during normal pumping operations, plus those of a positive displacement pump when priming is required. The new pumps, of single-stage, single-suction volute type, have no priming reservoir. Self-priming is accomplished by a small variable capacity, vane type 1750 RPM positive displacement pump which is mounted inside the main pump housing and is directly connected to the main shaft. When there is a loss of suction due to air or vapor in the system the priming pump automatically goes into action.

Available in capacities from 50 to 450 gpm, the new Gilbarco Roto-Prime pumps will handle a wide range of petroleum and chemical products in tank car and transport loading or unloading, as well as for loading and barrel-filling purposes, the company claims.

## (8) Lubricant Additive

A petroleum compound containing graphite has been developed by Southwest Graphite Company, Inc., Dallas, Texas, to be added to crankcase oils at each oil change. It is for use in automobiles, pumping engines, drilling engines, gear boxes, and compressors. Colloidal graphite is dispersed in oil and, it is claimed, creates on metal a "graphoid skin" that is tough and durable, and takes the wear, preserving the metal. It is also claimed that power is increased, oil and gasoline consumption are decreased, carbon formation is inhibited, valves will not stick, friction is reduced, that it is effective in engines burning high sulfur content gas, will not plug or clog oil grooves or oil lines, and cannot be removed by a filter.

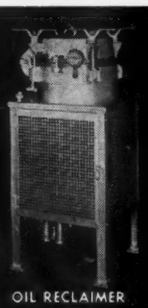
FOR CLEAN OIL and CLEAN ENGINES . . .

HILCO

OIL PURIFICATION EQUIPMENT

AIRLINE OIL PURIFIER

HYFLOW OIL FILTER



OIL RECLAIMER

Before You Buy or Specify - write for FREE literature

PURIFIERS · FILTERS · RECLAIMERS · CONDITIONERS

There's a HILCO for every engine lubrication and fuel oil Purifying Problem

THE HILLIARD CORPORATION 209 W. 4th ST • ELMIRA, N. Y.

In Canada: UPTON-BRADEEN-JAMES, Limited 990 Bay St., Toronto • 3464 Park Ave., Montreal

### (9) Triple Utility Mask

A new improved gasmask face piece, which provides chin-style, chest-style and hose-mask connections in one unit and retains all the full-vision advantages of its other types, has just been announced by Acme Protection Equipment Company, Chicago, Illinois. The company states that the new facepiece,

known as No. 6, provides the way to use the same mask for three different services, thus eliminating the need for a different facepiece for each service. It will include the regular Acme features of full-vision and dead-air check valve, and will introduce a new type inhalation-exhalation valve.

### (10) Roller Chains

The Morse Chain Company of Detroit, Michigan, and Ithaca, New York, is packing a line of Morse roller chains and parts. The manufacturer states Morse products will come in individual, corrugated cardboard cartons, sturdily constructed, and plainly labeled. Not only will this program expedite the shipping, storage and ordering of chains and parts, reducing handling costs to a minimum, but it also will simplify inventory problems. According to the manufacturer this is the first packaging program in the industry.

### (11) Boiler Alarm

A device for boilers to sound an alarm when the water level reaches low has been developed. Called the Campbell Micro-Thermal low-level boiler alarm, it is manufactured by J. A. Campbell Company, Long Beach, California. It consists of a simple 3/8 in. expansion tube with its inner end connected to the lower end of the water column on the boiler, its outer end is connected to the upper part of the water column by means of a 5/16 in. copper tubing. Therefore, the water rises and lowers above the expansion tube. When the water level reaches its low level the increased heat in the tube expands the tube, which actuates a micro-switch. The switch is a double throw type, is connected to a doorbell, buzzer, etc, and the other throw may be connected to a solenoid valve in the fuel line for extra safety.

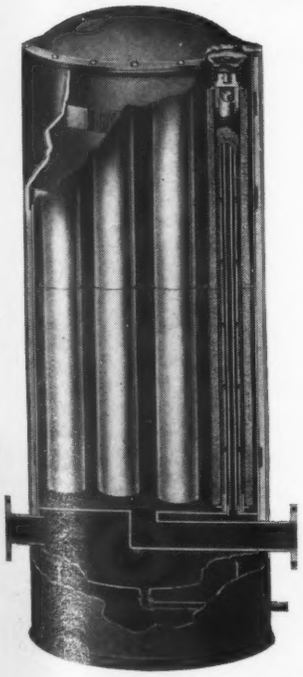
This device can be attached to any boiler water column regardless of boiler size or of length of column, by use of the flexible tube. The alarm switch is housed in a light metal box. It can be connected to a single 6-volt dry cell battery.

### (12) Pipe Threaders

An improvement in pipe threaders has been announced by The Ridge Tool Company, Elyria, Ohio. According to this manufacturer, the Ridgid 65R self-contained threader is now jam-proof. This means that it does not need to be watched while threading pipe by hand or power because a new drive plate automatically kicks out the driving ratchet pawl when standard length thread is cut. The lead screw therefore cannot jam on the workholder. Also available is the new jam-proof drive plate which can easily be put into present 65R threaders in place of old drive plate.


# HONAN-CRANE Oil Purification offers 3 types of interchangeable CARTRIDGE REFILLS

for correct handling of every purification problem

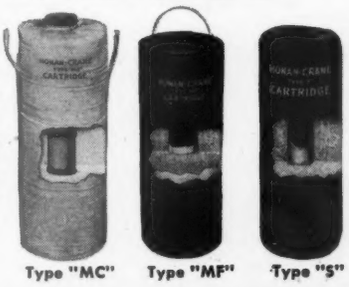


Three types of cartridge refills, designed by Honan-Crane especially for Honan-Crane purifiers, make it possible for you to select the filtering medium best suited to your purification needs. Cartridges are interchangeable and may be used to remove either solids or products of oxidation . . . maintaining any oil in approximately new condition.

Easy-to-handle Honan-Crane refill cartridges are your assurance of thorough oil purification at lowest cost.

**Honan-Crane Type "M" Continuous Oil Purifier**

Multiple-cartridge purifier, available in eleven sizes using 1 to 24 cartridges. Provides high flow rate and is designed to use easy-to-change "MC", "MF", or "S" type cartridges.



Type "MC" Type "MF" Type "S"

**Honan-Crane Type "MC" Cartridge**

"MC" Cartridge is a woven cotton bag containing 15 pounds of Cranite (specially processed fullers earth). Solids and abrasives as well as soluble products of oxidation such as asphaltenes, resins and acids are removed from the oil.

**Honan-Crane Type "MF" Cartridge**

"MF" Cartridge is a perforated metal basket lined with a woven cotton sock material and uniformly packed with Palconia (specially selected cellulose fiber filtering medium). Complete removal of solids such as abrasives, scale and other foreign matter.

**Honan-Crane Type "S" Cartridge**

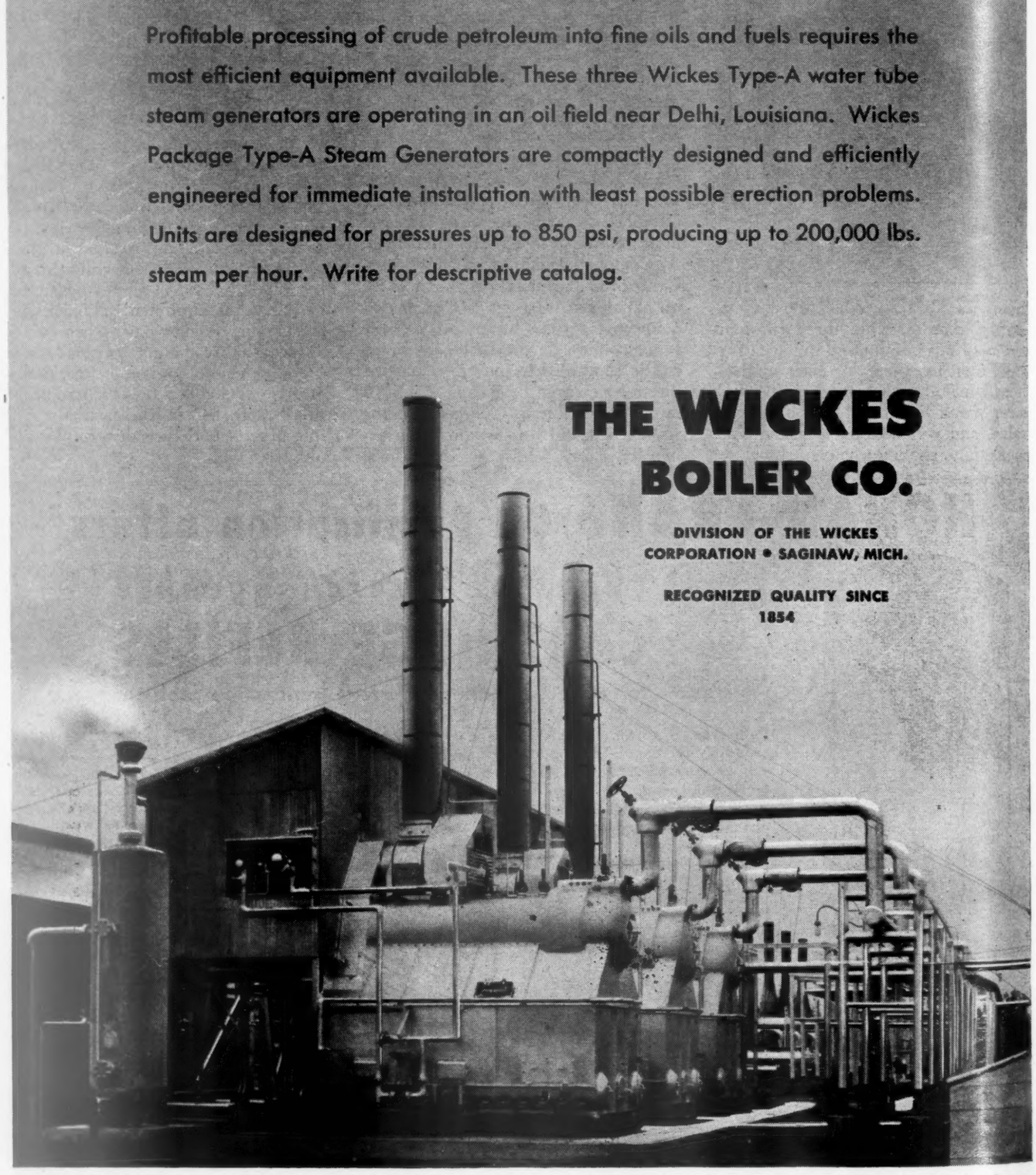
Type "S" Cartridge contains 4½ pounds of Palconia tightly packed in a specially woven cotton sock material. Performance of the cartridge is comparable to the "MF" cartridge in removal of abrasives, scale and other foreign solids.

Write for descriptive bulletins covering Honan-Crane Oil Purification Equipment for Diesel Lube and Fuel Oils, Turbine Oils, Cutting Oils, Quench Oils, Coolants, etc. State type of purification problem.

HONAN-CRANE CORPORATION
310 SUPERIOR AVENUE, LEBANON, INDIANA
A Subsidiary of HOUDAILLE-HERSHEY CORP.

# PETROLEUM PROCESSING SPEEDED WITH WICKES TYPE-A STEAM GENERATORS

Profitable processing of crude petroleum into fine oils and fuels requires the most efficient equipment available. These three Wickes Type-A water tube steam generators are operating in an oil field near Delhi, Louisiana. Wickes Package Type-A Steam Generators are compactly designed and efficiently engineered for immediate installation with least possible erection problems. Units are designed for pressures up to 850 psi, producing up to 200,000 lbs. steam per hour. Write for descriptive catalog.



**THE WICKES BOILER CO.**

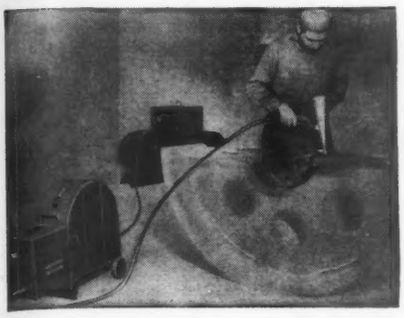
DIVISION OF THE WICKES CORPORATION • SAGINAW, MICH.

RECOGNIZED QUALITY SINCE 1854

SALES OFFICES: Atlanta • Boston • Chicago • Cincinnati • Denver • Detroit • Houston • Indianapolis • Los Angeles • Milwaukee • New York City • Pittsburgh • Saginaw • San Francisco • San Jose • Springfield • Seattle • St. Louis • Tulsa • Mexico City • Buenos Aires • Manila • Havana • Montevideo • San Juan, P.R. • Victoria, B.C.

### (13) Arc Welding Process

Lincoln Electric Company, Cleveland, Ohio, announces a new welding process employing welding current densities on 5/64 in. electrode wire which melt the electrode at speeds comparable to using 10,000 amperes on a standard 5/16 in. diameter coated hand electrode. The new "Hidensity" process can be used with any



standard Lincoln Electric SAE 600 or SAE 900 welding generator or an SAE 600 gasoline engine-driven generator. The new process uses either a 3/32 in. or a 5/64 in. diameter electrode wire. Welding currents up to 600 amperes are used with these wires which, on the small cross sectional area of the wire, produce extremely high current densities. These high densities create a deeply penetrating arc which in turn allows the use of high welding speeds. This also means that in general little or no edge preparation of joints is required, and therefore less weld metal is used in completely fusing the joint.

### (14) Threading Machine

The Landis Machine Company, of Waynesboro, Pennsylvania announces the "Landmaco" No. 2 automatic nipple threading machine and the "Landmaco" No. 2 automatic close nipple threading machine thread, ream, and chamfer nipples in a continuous automatic operation, thus eliminating secondary manual handling. Through a mechanism that transfers and turns the nipple end-for-end, these operations are performed on both ends in a continual cycle. The No. 2 automatic nipple threading machine is designed to produce commercial standard long nipples up to 6 in. lengths. This machine is built with two distinct size range capacities, the ½-in. and ¾-in. range and the 1-in. to 2-in. range. Incorporating the revolutionary new close nipple attachment, the automatic close nipple threading machine will produce commercial standard close, short, and special short nipples.

### (15) Air Intake Snubber

A new type air intake snubber for industrial noise abatement and improvements in exhaust snubbers, are available from the Burgess-Manning Company, Libertyville, Illinois. Designed for most industrial and non-critical locations, is for use on blower scavenged or naturally aspirated internal combustion engines, positive displacement rotary blowers and for mounting on top of filter houses used with pump scavenged internal combustion engines.

### (16) Valve Diaphragm

A chemically inert diaphragm for Grinnell-Saunders diaphragm valves has successfully completed its field testing and is now offered to industry by Grinnell Company, Inc., Providence, Rhode Island. This thermoplastic (KEL-F*) has been successfully moulded to form a tough and very flexible valve diaphragm, which withstands such hard-to-handle materials as chlorinated aliphatic and aromatic compounds; concentrated nitric, chromic, hydrofluoric and sulfuric acids, and most solvents that readily attack rubber and synthetic diaphragm materials, the manufacturer states.

*Trade name registered by M. W. Kellogg.

X A.P.I. COUPLINGS FOR OIL FIELD USE

EVERY SIZE AND TYPE FROM *ONE* SOURCE

**LINE PIPE COUPLINGS A.P.I.**
⅛" to 12"—Seamless and Special Processed—Black or Galvanized

**PLAIN TUBING COUPLINGS A.P.I.**
1" to 3"—Seamless

**EXTERNAL UPSET TUBING COUPLINGS A.P.I.**
¾" to 3½"—Seamless

**CASING COUPLINGS A.P.I.**
4½" to 13⅜"—Long or Short

**HYDRAULIC COUPLINGS**
⅛" to 3"—Seamless

**REAMED AND DRIFTED A.I.S.I.**
¾" to 12"—Seamless or Spl. Processed

**DRIVE PIPE COUPLINGS**
⅜" to 12"—Seamless or Spl. Processed

***Consult Our Nearest Quick Service Sales Office:***

**Albany, N. Y.**—Albert L. Becker, 434 Clinton Ave.
**Baltimore**—Ted Barto, 2301 N. Charles St.
**Boston**—Wm F. Bennett, 24 Spring St., Somerville
**Buffalo**—W. E. Spencer & Assoc's, 241 S. Elmwood Ave.
**Chicago**—Harry A. Jay, 122 So. Michigan Ave.
**Denver**—Earl H. Jones & Co., 1863 Wazee St.
**Detroit**—Thomas L. Osberger, 19451 Livernois Ave.
**Erie, Pa.**—R. J. Maggi, Box 711
**Houston**—Henry H. Paris Distributor, Inc., Box 932
**Kansas City, Mo.**—Wm. J. Hebenstreit, 3122 Coleman Rd.
**Los Angeles**—James A. Riordan Co., 1400 Santa Fe Ave.
**Minneapolis**—Lin J. Krause, 200 Lumber Exchange
**Newark, N.J.**—Murray Eskin, Industrial Office Bldg.
**New York**—Henry Stein, 50 Cliff St.
**Philadelphia**—J. W. Worthington, 401 N. Broad St.
**Portland, Ore.**—Earl H. Jones & Co., 1233 NW 12th Ave.
**Richmond, Va.**—P. C. Abbott & Co., Mutual Bldg.
**San Francisco**—Earl H. Jones & Co., 1150 Folsom St.
**Seattle**—Earl H. Jones & Co., 619 Second Ave.

FACTORY 'PHONE: ELM GROVE 3296

**WHEELING MACHINE PRODUCTS COMPANY**
ELM GROVE STATION — WHEELING, W. VA.

**SAND-BANUM SPECIAL**
**Pure, Concentrated, Colloidal Tablet**
*Safely Removes and Prevents Rust and Scale in ALL Radiator Cooling Systems*

•

*and for Boilers*
**SAND-BANUM STANDARD**
*Brings the Same Safe Efficiency in Removing and Preventing Boiler Scale*

•

Stocked by Leading Supply Houses

o

*Send for Literature*

AMERICAN SAND-BANUM CO.
Established 1926
9 Rockefeller Plaza
New York 20, N.Y.

**ARMSTRONG BROS.**
***Better* PIPE TOOLS**

**CHAIN TONGS**

"Reversible," "Standard" and "Ideal" types in all sizes. Jaws are drop forged from special steel, are carefully milled, heat treated hardened and tested. The *Handles* are forged spring steel. The *Chains* are proof-tested to ⅔ catalog strength (1,200 lb. to 40,000 lb.). "Reversible" Jaws give double jaw life. "Standard" Jaws have extra bearing on the handle and forged-in chain guides. The "Ideal" Tongs have V shaped teeth for a sure grip on irregular shapes—fittings, etc.

Write for Catalog

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
5231 W. ARMSTRONG AVENUE • CHICAGO 30, ILL.


## (17) Continuous Flow

The new Merla type "L" valve is designed to provide efficient gas lift production in continuous flow operations. Manufactured by Merle Tool Corporation, Dallas, Texas. It consists of a three-ply seamless Monel bellows, compression spring, valve stem, valve, valve seat, and choke. The fluid filled bellows provides protection against bellows damage due to excessive hydrostatic pressure. A scientifically designed compression spring assures a constant operating pressure under extreme temperatures. A choke below the valve seat governs the required gas passage of the valve.

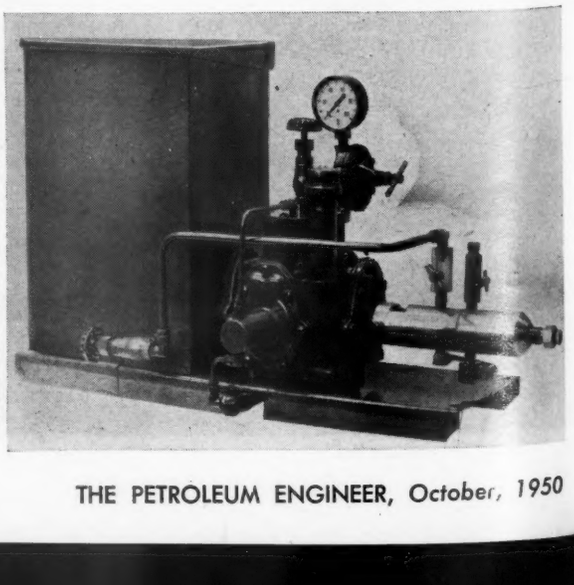
## (18) Stacking Tote Box

A new type of stacking and nesting tote box that is formed in one seamless piece from the Royalite thermoplastic material is now being manufactured by United States Rubber Company in its Chicago plant. Handles are formed into the roll of the upper lip so that the tote box can be picked up from any side. All corners are rounded. The tote box is designed for criss-cross stacking, with adequate locking when boxes are stacked. Contents of each can be easily seen when stacked. The manufacturer states that the boxes take up little space, are very light weight, easy to handle, and easy to clean. They are extremely tough, with high resistance to impact. They are also acid-resistant, non-toxic and have a low water absorption.

## (19) Chemical Injector

A new type of chemical injector pumping unit designed specifically for use by refineries, the oil industry, and chemical plants is being placed on the market by the McFarland Engineering and Pump Company of Houston, Texas. It is comprised of a 4-cylinder rotary type crankshaft motor with an injector unit. The motor is flooded by an oil pump, all parts of which operate in a complete oil bath that surrounds the sides of the pistons.

Operating on air, gas, or any liquid type pressures from 1 to 75 lb the injector is of the plunger type and as many as three injectors may be used on one motor. Each injector is controlled individually, one injector can pump 1 oz while others may pump 1 oz to 50 gal in 24 hr. The injection volume is constant regardless of temperature changes as each works from the crankshaft and makes the same length stroke.



## (20) Industrial Fan

Development of a high efficiency industrial axial fan employing aerodynamic design principles and aircraft production techniques has been announced by the Aeromatic Propeller Department of Koppers Company, Inc. The new "Aeromaster" fan is applicable to engine jacket water coolers for natural gas, gasoline, or diesel engines, vertical air discharge condensing units, various oil field and power utility air coolers and water coolers, and large air conditioning systems.

## (21) Stripping Tool

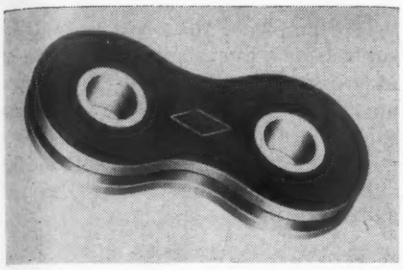
Aeroquip Corporation of Jackson, Michigan, has available a hose cover stripping tool for removing the outer cover from Aeroquip double and single wire braid hose as is necessary prior to attaching the fittings. While the outer cover may be removed by hand, the Hose Cover Stripping Tool, No. F-1785, will greatly speed up this operation and allow users to take even greater advantage of the many features of Aeroquip Hose Lines.

## (22) Dry Cooling Equipment

Three new DriCooler models have been added to the line of dry cooling equipment manufactured by The Marley Company, Inc., Kansas City, Kansas. Two of the models are small "portable" units, and the other model is designed to fill the need for a medium size unit. Although designed primarily for cooling engine jacket water, they can also be used for cooling natural gas, lube oils, chemical solutions, fluids of refining stages, and ammonia or steam condensing. Models L and M, the portable units, are both forced draft and have the same cooling capacity. There are seven different sizes of each model. Model JJ units are larger in capacity, and are also forced draft, with horizontally mounted sections. The four sizes of this model supplement the heavy-duty application DriCoolers, Models J and K.

### (23) Connecting Link

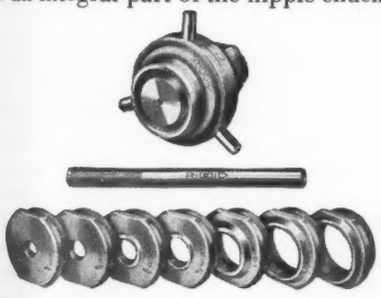
A patented bushed center plate connecting link has been developed for use with the Diamond multiple-strand roller chain for severe service. This connector, made by Diamond Chain Company, Inc., Indianapolis, provides durability, closely matching that of the Diamond press-fit center plate multiple-strand chain. The same ease of connecting and disconnecting the chain is thus provided as with slip-fit center plate design links, thus simplifying the handling of multiple-strand



chains. The new connectors, which are being produced for ¾-in. through 2½-in. pitch diamond multiple-strand roller chains, have file-hard bushings pressed into pitch holes of pairs of plates, making one unit with the bushings.

### (24) Nipple Chuck

A new nipple chuck for the threading of short nipples is announced by The Ridge Tool Company, Elyria, Ohio. This Ridgid nipple chuck is of simple design which fits any threading machine or vise without special tools, parts or adjustments, according to the manufacturer. It requires no adjusting or changing of the stop plug which is an integral part of the nipple chuck,



and is said to be always automatically in position for use. Nipples to be threaded are screwed in by hand, and after threading, released instantly by an easy turn of the chuck, so they can be unscrewed by hand. The device is made also for British standard pipe thread. A handy patented carrier is furnished with each complete set.

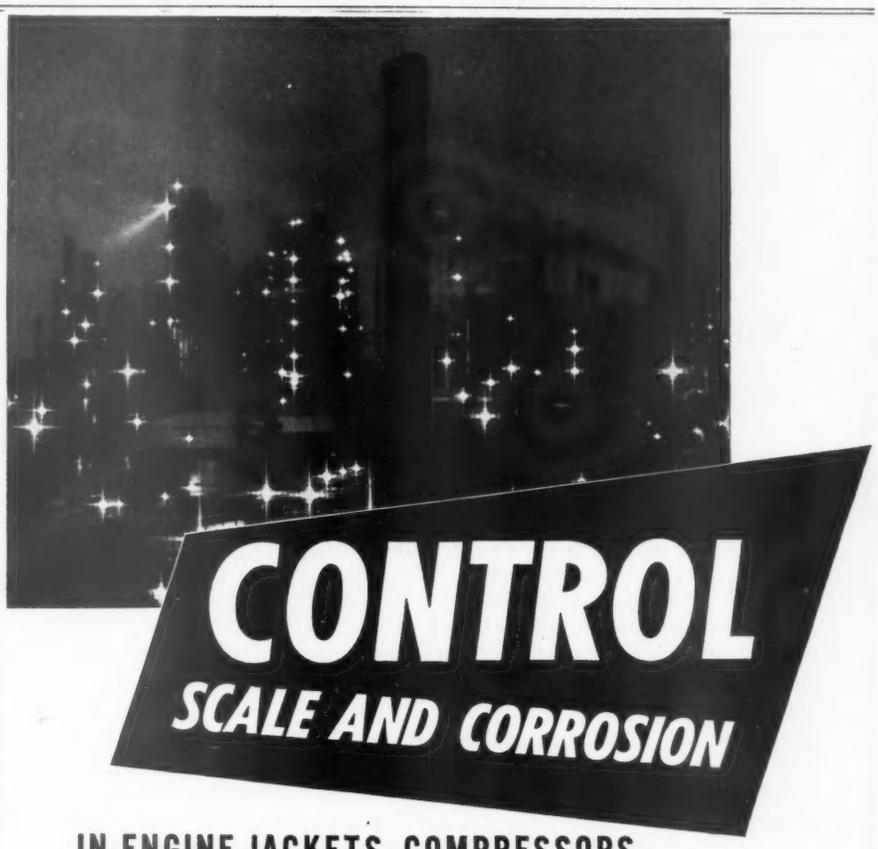
### (25) Tachometer Generator

The new Type E tachometer generator developed by Weston Electrical Instrument Corporation, Newark, New Jersey, has been specifically designed for use where there may be explosive atmospheres. Available as either an a-c or a d-c generator, this type is listed by Underwriters' Laboratories, Inc., for use in two classes of hazardous locations: Flammable and explosive mixtures of vapors and gases with air, and combustible mineral and grain dusts in air. Its construction makes it particularly suitable for use in oil refineries, chemical plants, grain elevators, flour mills, coal mines, and similar locations where explosive atmospheres may occur. The generator is enclosed in a cast iron housing having 4 ft for mounting.

### (26) Plastic Tubing

Tygon flexible plastic tubing is now available in giant bore sizes ranging from 1⅜ in. to 2½ in. OD. according to an announcement by its manufacturer, The U. S. Stoneware Company, Akron, Ohio.

This larger bore plastic tubing was developed to meet a demand for a tough, translucent, non-toxic flexible hose for bulk handling of liquid food products, drugs, and chemicals. Its translucency permits quick, visual inspection of flow, facilitates spotting obstructions or foreign material, and simplifies cleaning procedures.


IN ENGINE JACKETS, COMPRESSORS
COOLING TOWERS—*Wherever Water is Used*

• Increase efficiency of equipment by maintaining scale-and-corrosion-free water side surfaces.

• Prevent expensive shut-downs and replacements by using WRIGHT Water-Conditioning Chemicals.

Wright CHEMICALS

WRIGHT CHEMICAL CORPORATION
*Specializing in Water Conditioning*
GENERAL OFFICE AND LABORATORY—635 W. Lake Street, Chicago 6, Ill.
OFFICES IN PRINCIPAL CITIES
*Sole Distributor of Nelson Chemical Proportioning Pumps*

### (58) Hydraulic Pulling Tool

The Hunt Tool Company, Houston, Texas, announces its new hydraulic pulling tool. This tool is designed especially for pulling packers and liners in one trip without putting pulling strain on the drill string or tubing. It attaches to the bottom of the tubing or drill pipe and provides high pulling capacity directly above the fish. This new tool has three parallel operating slip segments which set the tool firmly in position. After the slip is set, hydraulic pressure provided by a surface pump provides a breaking out pull far more powerful than the drill string could support. When the fish is free, the slip is collapsed and the fish is lifted out by the drill string.

### (59) Bonding Equipment

Dresser Manufacturing Division, Bradford, Pennsylvania announces the introduction of a new bonding kit, "Dresser-Bond," which greatly simplifies bonding of mechanical couplings on steel pipe lines. The kit, consisting of 50 preformed bonds, welders, flint gun, flash powder, metal discs, and coating compound for completing 50 bonds, employs a 5-second chemical welding method that any ordinary workman can use.


for Speedy . . . Low-Cost Cleaning of Rigs, Diesels, Rotary Tables use

Oakite Steam-Detergent Cleaning

FOR speedy, low-cost cleaning of rotary tables, mud hogs, crown blocks, drilling rigs, drilling-rig Diesels, pipe lines, etc., try Oakite Steam-Detergent Cleaning. In fact try it on the toughest cleaning or paint-stripping job that comes along.

By combining the vigorous detergent action of a specialized Oakite material with mechanical force and heat, Oakite Steam-Detergent Cleaning literally blasts dirt away. Grease and muck disappear almost like magic. You'll particularly like the way you can clean hard-to-get-at recessed areas.

Oakite Booklet "How to Cut Cleaning Costs in the Petroleum Industry" contains details. Shows how to speed up and cut costs on other maintenance cleaning jobs with Oakite Steam-Detergent Cleaning. Copy mailed promptly on request. No obligation.

**OAKITE PRODUCTS, INC., 44c Thames St., NEW YORK 6, N. Y.**

*Technical Service Representatives in Principal Cities of U. S. & Canada*

SPECIALIZED INDUSTRIAL CLEANING

OAKITE

TRADE MARK REG. U. S. PAT. OFF.

MATERIALS • METHODS • SERVICE

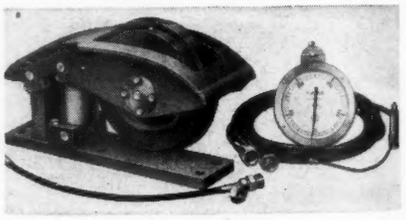
*Technical Service Representatives in Principal Cities of U. S. & Canada*


### (60) Oxygen Analyzer

A. O. Beckman, Inc., Pasadena, California, has recently released for industrial and scientific applications the Beckman oxygen analyzer. The machine is adapted to fields of oxygen measurement in power plants, chemical and metallurgical processes, oil refineries, and a wide range of other applications. The instrument is operated automatically, directly on the gas sample as received. Measurement is based on the fact that oxygen is unique among gases that are strongly attracted into a magnetic field. The operating principle of the oxygen analyzer consists of a dumbbell shaped element of two small hollow glass spheres supported on a quartz fiber. The glass spheres rotate and are subjected to a magnetic force proportional to the volume susceptibility and the gas which the spheres displace.

### (61) Torque Gauge

Martin-Decker Corporation, Long Beach 7, California, has developed a streamlined "Hydro-Mech" torque gauge that gives the driller a rugged dependable instrument for indicating torque in the drill pipe. It instantaneously measures either the total torque or net-torque-on-bit at the driller's position. It operates on any type of power, internal combustion or steam (including diesel). The manufacturer

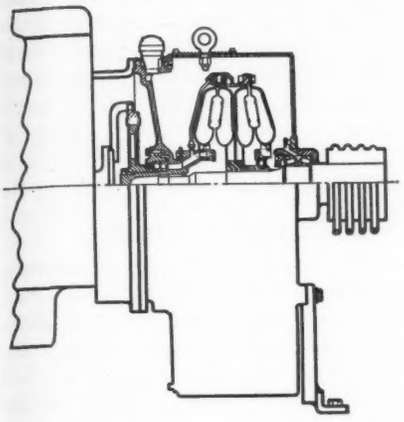


claims the Hydro-Mech saves chain, increases footage on deep wells, increases footage when drilling with small bits and is useful for milling, cutting jobs and diamond coring.

The assembly consists of a load-sensitive element—chain idler, load responsive cylinder, high-pressure hose, damper, and 6-in. "rotate-able" dial indicating gauge. The idler wheel is pushed (chain trust) by the tight side of the rotary chain. The push is directly related to the torque in the drill pipe; the higher the torque, the tighter the chain. The load-sensitive element, connected to the same lever arm as the idler wheel, builds up a hydraulic pressure to oppose the chain push. This pressure is used to actuate the dial gauge at the driller's position, indicating the instantaneous torque in the drill pipe. The Hydro-Mech Indicating Gauge can be installed as an individual unit or as an integral part of other Martin-Decker drilling controls.

### (27) Hydraulic Coupling

The Twin Disc Clutch Company, Racine, Wisconsin, announces the Model HUD disconnecting hydraulic coupling (patent pending), a new type of hydraulic drive which



"dumps" the hydraulic fluid when desired to serve as its own master clutch and provide a complete disconnect between the prime mover and load on such applications as drawworks, slush pumps, and some types of engine compound drives.

### (28) Roller Blade

A blade attachment that speeds covering and leveling of all types of excavation and trenching work, has been announced by Schield Bantam Company, Waverly, Iowa. Designed for fast, interchangeable operation with the ⅜ yd truck-mounted Schield bantam trench hoe, the new backfiller consists of a cable-operated steel blade mounted on a wishbone dip stick, with two tubular control arms, which hold the blade vertical to the ground as it is pulled toward the machine.

Equipped with heavy-duty 24-in. by 60 in. blade with ½ in. reversible cutting edge, the attachment is reported to have a maximum reach of 23 ft 6 in. any direction, plus ability to work to within 6 ft 6 in. of the center of machine rotation. The manufacturer claims it can also be controlled vertically to within 1 in. of the ground surface.

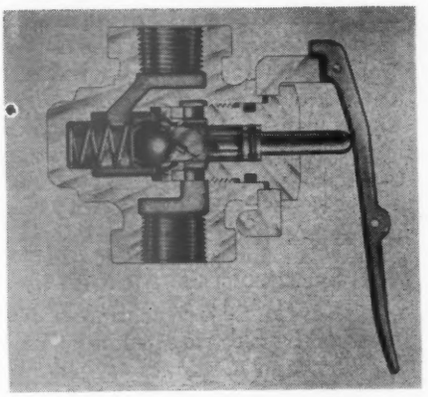
### (29) Lightweight Drill

A lightweight utility drill for plant maintenance crews has been announced by Gardner-Denver Company of Quincy, Illinois. The S17 utility drill comes in a carrying case with a complete kit of drill accessories, including a 14-in. drill steel and three assorted-size rock bits, a star drill adapter, and 25 ft of air hose. It is said to be a full-fledged, self-rotating pneumatic hammer drill that weighs only 19 lb. According to reports, it's a handy tool for placing anchor bolts, for running conduit, cable, pipe, and for many other jobs. A special stop-rotation feature converts the S-17 to a lightweight chipping hammer or pick.

### (30) Control Valve

A new valve has been designed by Page Oil Tools, Inc. of Long Beach, California for use in oil refineries, chemical and industrial plants where it is desirable to have controlled flow and positive shut-off on fluid handling lines. The stem is parabolic in shape and incorporates a predetermined fixed orifice that gives a smooth, even increase in flow as the handle is actuated to open the valve. The valve closes with a positive shut-off when the handle is released.

The seat design embodies an exclusive feature, claims the company, of a triple seal that is responsive to hydraulic pressures. The rubber is bonded in



the seat and communicates through several drilled holes to the inner seal that seals around the stem. Primarily, the outer seal prevents fluid leakage around the outside of the seat. The inside of the same seal prevents leakage around the ball. The third seal prevents leakage around the stem.

### (31) General Service Pumps

De Laval Steam Turbine Company, Trenton, New Jersey has announced a new line of small standardized general service pumps in which all parts except the bare pump casing are contained in the rotor assembly. When maintenance is necessary, the top cover and end plate studs may be removed, the assembly lifted out, and a new one dropped in place. Through the De Laval service and exchange plan new rotors are available for immediate shipment from factory stock. The old one is returned and full credit given for all serviceable parts. The manufacturer states that as an alternate to this, a customer can exchange the entire pump for a factory rebuilt and guaranteed pump, with full credit being allowed for serviceable parts.

### (32) Splash-Proof Motors

The Elliott Company, Jeannette, Pennsylvania, has developed splash-proof motors, satisfactory for installation out-of-doors without external protective covering. This pioneering in outdoor and semi-outdoor central station design has been an aggressive approach to cost reduction and station simplification. The horizontal type Elliott outdoor splashproof motor can be placed on foundation or base of the driven machine. Its ventilating air inlet openings are located on the sides of the motor and discharge between the feet. Both provide a straight-through path for high-velocity wind and rain, thus by-passing the interior of the motor. The vertical motor is normally mounted on top of vertical pumps, well up from the ground; thus permitting air intake through bottom of motor and side discharge.

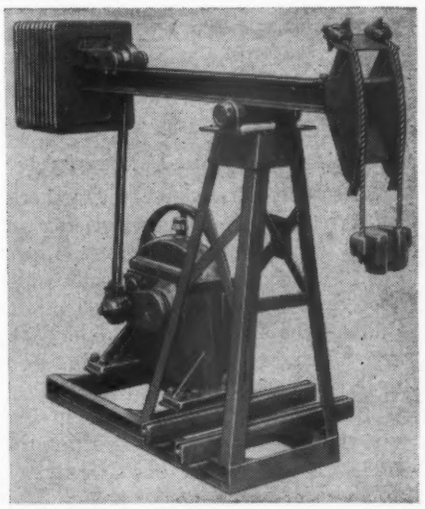
### (33) Trucks

Mack Trucks, Inc., New York, New York announces its new line of Golden Anniversary Model A trucks. The models range in size from 17,000 lb for medium duty hauling to 40,000 lb in the tractor semi-trailer model for heavy duty highway work.

Each type of truck was designed with a view toward special use, stated the manufacturer. In designing the models, driver comfort, convenience, vision, and ease of handling were emphasized. Some of the engineering features are completely new, others are advances in truck-engine design.

### (34) Pumping Unit

Altens Foundry and Machine Works, Inc., Lancaster, Ohio, announces the production of a new pumping unit, the A20-6. This unit is



designed primarily for very shallow oil and water wells. The manufacturer states that it incorporates the finest quality gears, bearings, and heavy structural parts.

# Trade Literature

Publications will be sent free. Circle the number on the coupon.

### (35) Casing Scraper

A booklet has been issued by Baker Oil Tools, Inc. describing in detail the new Roto-Vert casing scraper. This tool is recommended where it is necessary to scrape away the cement and mud sheath from top to bottom of the hole, or where extensive perforation burr and bullet removal is involved. It can be run on drill pipe for vertical scraping of the hole as it is lowered, and also rotated where the condition of the casing requires. The brochure also provides a complete description of Baker's regular rotary casing scraper, which is recommended for use above the drilling bit to remove mud cake, cement, and other obstructions, such as perforation burrs. Besides describing these two implements the brochure is a small text book on scraper techniques and the factors that prompted their developments.

### (36) Self-Priming Pumps

Complete information on the new self-priming centrifugal pump line is now available from Goulds Pumps, Inc., Seneca Falls, New York. The pumps are of a new design that eliminates valves and yet gives efficiency comparable to standard centrifugal pumps, the manufacturer has announced. These self-priming pumps are made in sizes ranging from ¼hp to 5 hp, with both open and closed impellers. Capacities to 120 gpm, and heads to 135 ft depending upon capacity. They can handle suction lifts up to 25 ft.

### (37) Welded Steel Tubing

The structural advantages, methods of fabricating, and characteristics of welded steel tubing are discussed in a new 12-page, illustrated booklet published by Armco Steel Corporation, Middletown, Ohio. The booklet outlines the characteristics of tubing and shows a variety of uses where tubing has been used to cut manufacturing costs, reduce weight, increase strength, and improve appearance. Complete information is included on how hot and cold rolled as well as zincgrip and aluminized tubing is supplied, size limits, finish, tolerances and properties, and how it should be ordered.

### (38) Pumping Units

The new Ideco Safety Cut-Out Switch Bulletin No. CS-50 describes in detail the working principles of the Cut-Out Switch, which will shut down the prime mover on the pumping unit when the rod string breaks, or when any part of the machine fails or gets out of adjustment. The switch operates automatically when the walking beam is jarred from any cause whatsoever. The switch is designed with either an electric motor or combustion engine prime movers. The bulletin is illustrated with examples and installation diagrams.

### (39) Electrical Generator

When Power's Off . . . You're Safe! is the title of a small but interesting new folder recently issued by D. W. Onan & Sons, Inc., Minneapolis, Minnesota, manufacturers of electric generating plants. A full page of illustrations shows a number of institutions and business establishments that are protected 24 hours a day with Onan standby installations.

### (40) Synchronous Motors

Bulletin No. 200, Synchronizer No. 31, issued by Electric Machinery Mfg. Co., Minneapolis, Minnesota, contains an article on the modern Parke-Davis antibiotic plant at Detroit, pointing out the role of synchronous motors in the production of chloromycetin. Also of immediate interest is a feature article showing recent synchronous motor installations in the gas industry. Other articles in this 24-page bulletin are: Wound-rotor motors, excitation for synchronous motors (includes a motor performance chart), air coolers for generators and motors, shaft currents in a-c machines, how magnetic drives stop biggest loss in boiler plants, and a helpful service article.

### (41) Portable Recorder

Wallace and Tierman Products, Inc., Belleville, New Jersey has published a new bulletin, TP-18-A illustrating and describing its portable direct current recorder. This instrument is a direct writing recorder and adjustable over a wide range by the user. It has a minimum full scale range of 100 microamperes, and a maximum full scale range of 5000 milliamperes. It is particularly suited for laboratory use as it alone takes care of many measuring problems.

### (42) High Pressure Pumps

The Aldrich Pump Company, Allentown, Pennsylvania has published a new data sheet 64-B, describing the recently designed Aldrich 5 in. stroke multiplex direct flow pumps. This 6-page bulletin covers design advantages, construction, specifications, and drive requirements. Also included are: A pump selection chart, dimension drawings, plunger, pressure, and capacity data on both the 5 and 7 plunger units. The capacity range of these two pumps, in barrels per day at 100 rpm, is from 292 up to 5060 bbl.

### (43) Seamless Tubes

The latest edition of a reference handbook on methods of working seamless tubes and pipe of the Intermediate B&W Croloys, ferritic air-hardening alloys containing ½ to 9 per cent chromium, is offered by The Babcock & Wilcox Tube Company, Beaver Falls, Pennsylvania. It incorporates new data accumulated since 1946, the publication date of the previous issue. Arranged for easy reading, it is indexed and illustrated with photographs, diagrams, and reference tables.

### (44) Core Bits

Koebel Diamond Tool Company, Detroit, Michigan has recently published an 8-page catalog containing the latest information on its insert type diamond core bits, core barrels, and special diamond tools. Diamond Tool Company has developed many diamond tool improvements, according to the company. Among these are exclusive patents for powered metal matrix for diamond setting and the use of separate inserts, including U.S. and foreign patents.

The forged steel bit body is of alloy steel, treated to relieve all internal stress and machined to close tolerances to receive the inserts.

### (45) Products, Services

A 14-page catalog is now available from Condenser Service and Engineering Company, Inc., Hoboken, New Jersey, concerning the company's products, plants, facilities, and services. It is completely illustrated with the numerous types of equipment that the company builds, plus that which it redesigns, rebuilds, repairs, and modernizes, whether built by the company or by others.

Full maintenance and spare parts service are available for all products listed, states the manufacturer. Also available are bulletins covering any product or service briefly mentioned in this condensed catalog.

### (46) Turbine Pump

The 16-page bulletin just issued by Layne and Bowler, Inc., Memphis, Tennessee, titled "Layne Short Coupled Service Pumps," contains cutaway drawings of pump bowls and discharge column. Sixteen sketches show the Layne vertical turbine pump applied to river and re-lift service, boosting, recirculation, cooling tower, drainage, gas and oil pumping, and fire pumps.

### (47) Engineering Data

The Fluid Packed Pump Company, Los Nietos, California has just issued a 24-page handbook on engineering data and production calculations applicable to all types of sub-surface oil-well pumping equipment. Time-saving tables and formulas cover the problems of pumping calculations completely. Some of the subjects included are: Pump displacement, efficiency, and capacity; impulse factor; counterbalance; torque; plunger stroke, and pump selection.

### (48) Communication Systems

A brochure describing Philco microwave communications systems and Philco pulse amplitude modulated (PAM) multiplex terminals is now available for distribution. Copies may be obtained by writing Philco Corporation, Industrial Division, Philadelphia 34, Pennsylvania.

### (49) Gear Coupling

The new 4-page folder on the Sier-Bath gear coupling is now available from the Sier-Bath Gear and Pump Company, Inc., North Bergen, New Jersey. The bulletin illustrates and explains the simplified 7-part construction of the Sier-Bath gear coupling, and compares it with other gear types. Detailed plan drawings and specifications for standard, mill motor, vertical shaft, spacer and floating shaft types are included.

### (50) Speed Reducer

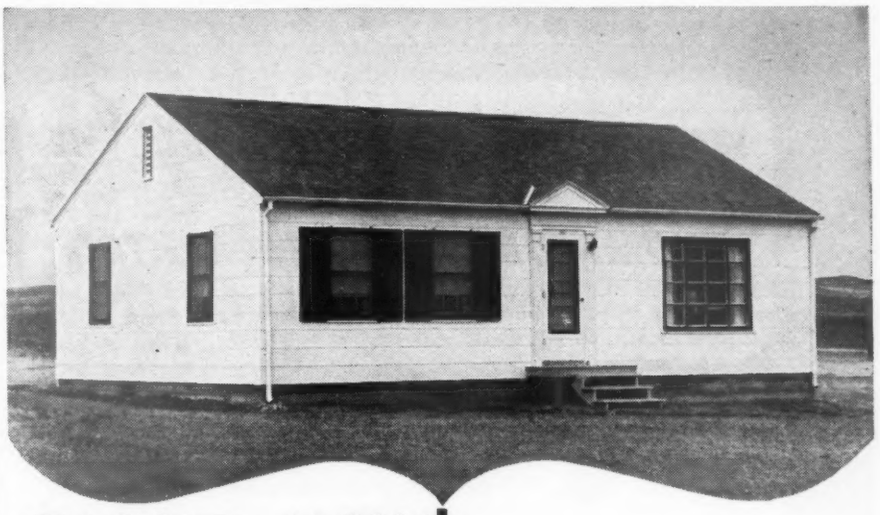
The Falk Corporation, Milwaukee, Wisconsin, has announced its release of two new bulletins illustrating and describing its concentric shaft speed reducer and right angle shaft all-steel speed reducer. The speed reducers, which are improved with all steel housing design, are made for a wide variety of power transmission requirements in almost every industry, according to the company. They are adaptable to: Electric motor drives, belt drives, gas engine drives, chain drives, etc., and are suitable for use as a speed increaser or reducer. They are rated according to standards of American Gear Manufacturers Assn.

### (51) Ammonia Compressors

A bulletin, No. C-1100-B-36, describing the newly developed "Y" ammonia compressors—both single and two-stage—has been announced by Worthington Pump and Machinery Corporation. Outstanding features include: Cylinders and heads provided with large water jackets, box section crossheads, babbit faces, completely enclosed frame, low-pressure piston, self-draining cylinder, and full-floating hollow crosshead pins. Specifications and over-all dimensions are included in the bulletin.

### (52) Unions and Valves

Catawissa Valve and Fittings Company of Catawissa, Pennsylvania has made available its 20-page catalog illustrating the company's complete line of hot forged steel unions and valves. Also included are complete data, specifications, as well as prices. This is the company's first general literature release picturing both the standard and double extra heavy hot forged steel unions as well as its orifice, male and female, lug nut, and full stainless steel and fully alloy steel unions.

RIGHT NOW... YOU CAN HAVE THE STURDYBILT HOUSES YOU NEED

Order today and get quick delivery of the STURDYBILT houses you need. Homes, warehouses, tool houses or any other building can be delivered and erected in record time. Write today for information.

MANUFACTURERS OF SPECIAL MILLWORK: DISTRIBUTORS OF JOHNS-MANVILLE BUILDING MATERIALS: CURTIS WOODWORK

STURDYBILT
SOUTHERN MILL & MANUFACTURING CO.
Tulsa, Oklahoma
*Prefabricated, Demountable Houses*

phmi PREFABRICATED HOME MANUFACTURERS' INSTITUTE

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125-45 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

### (53) Koneshot Perforating

Lane Wells Company, Los Angeles, California has published a 2-color brochure featuring its new open-hole Koneshot Gun. Exclusive features of this new gun, state the company, are: Stronger carrier for safe operations under high pressures and high temperatures; larger explosive charge gives deeper penetration, and complete fragmentation gives greater scouring action and easier clean-out. The gun assures complete disintegration, claims the company. The fragments, which average about ¾ths of a square inch in size, "scour" the wall of the hole and fall to bottom. They are easily and quickly cleaned out with sand pump or bailer.

### (54) Roller Chains

The Morse Chain Company, division of Borg-Warner Corporation, Detroit, Michigan, in recently announcing a complete packaging program for roller chains and parts has produced a four-page catalog insert, which gives complete details. All available standard packaged quantities are listed together with package weights and list prices.


"KILLER" SHALE SAYS:

WHY DIDN'T SOMEONE TELL ME THEY HAD A THOMPSON SHALE SEPARATOR ON THIS WELL?

Shale and abrasives are given the bum's rush when drilling mud goes through a Thompson Shale Separator. Only clean mud, with nothing to chew up expensive drilling equipment, goes back into the well. And there's a Thompson model for any volume of mud flow! The biggest mud pump now in operation can't pump too fast for a Thompson "DWF"—the largest of the Thompson models. *Low cost to buy . . . no cost to operate!* Attached SAMPLE MACHINE adds to profits by providing accurate foot-by-foot samples of cuttings.

*Write Today for Free Illustrated Folder Containing Complete Data on all Thompson Separators!*

**THOMPSON TOOL CO.**

IOWA PARK, TEXAS

KEEPS DRILLING MUD CLEAN — PROVIDES *TRUE SAMPLES* OF CUTTINGS


### (55) Steel Grating

William F. Klemp Company of Chicago, Illinois, announces the publication of a 1950 technical manual entitled "Klemp Open Steel Grating," a 24-page 3-color booklet explaining and illustrating with actual photographs the different types of Klemp diamond riveted open steel grating and Klemp welded electeo-forged open steel flooring and stair treads, as well as Klemp open steel bridge decking, Klemp aluminum bridge decking and Klemp aluminum grating. This completely new catalog, by the 43-year-old Klemp Company, includes safe load tables, engineering details and layouts and date and photographs illustrating subway grating, oil company installations, power house installations, aluminum sewage disposal installations, docks, foundries, and atom laboratory installations.

### (56) Calipering Service

Otis Pressure Control, Inc., has published a new technical folder on its calipering service, which determines the internal corrosion condition of oil and gas-well tubing and casing. The bulletin was issued in connection with the development of Otis' new casing caliper, which has 30 independently operating feeler points that contact the inside area of the pipe and plot the location and depth of corrosion pits on a sensitized metal chart especially developed for Otis calipering instruments by the firm's design engineers. The metal chart is reproduced twice-size and included as part of the resort on the corrosive condition of the well as analyzed by Otis engineers. The casing caliper, usually run on a sand line or logging line, can survey 5½-in. to 8⅝-in. pipes.

### (57) Equipment for Export

D. W. Onan & Sons, Inc., Minneapolis, Minnesota, manufacturers of electric generating equipment, has prepared a booklet describing the entire line of Onan products available to the export market. Included in this 12-page folder is a list of suggestions for negotiating export documents. These suggestions are the result of Onans' years of experience in the export market and will assist overseas importers in the preparation of such documents necessary in the import-export trade. The entire line of Onan products is described and illustrated in this attractive booklet. Onan electric generating plants, both gasoline and diesel powered, are shown. Onan air-cooled, 4-cycle engines and separate ball-bearing generators are listed. Four different models of water-cooled Onan marine generating plants are illustrated.

**The Carboniferous Rocks of the Llano Region of Central Texas,** *by F. B. Plummer. Published by the University of Texas. Pages, 170. Price, $3 cloth bound, $2 paper bound.*

The problems of carboniferous stratigraphy and paleontology of Central Texas were of great interest to Frederick Byron Plummer, author of this volume on basic and detailed information of carboniferous rocks. He was a former geologist on the staff of the Bureau of Economic Geology at the University of Texas, and in a sense this work is a progress report of results of his research up to the time of his death. This volume is illustrated by 14 text figures, 4 charts of fossil distribution, and 22 plates.

**The Petroleum Chemicals Industry,** *by Richard Frank Goldstein, John Wiley and Sons, Inc., New York. Pages, 416. Price, $8.50.*

Reviewing the possibilities and problems of the petroleum chemicals industry, this book covers a wide range of subjects dealing with the manufacture of synthetic organic chemicals. The primary objective is to survey the fields of industrial chemistry in which oil is the most economic basic material. Because of Dr. Goldstein's British background he was able to review this essentially American industry impartially. He has presented a thorough description of the industry—what has been done since 1940.

**Motor Oils and Engine Lubrication.** *By Carl W. Georgi. Reinhold Publishing Corporation, New York, N. Y. Pages, 514. Price, $8.50.*

Since lubrication and the refining and evaluation of lubricants have made such enormous strides in the last two decades and is fast becoming a science as well as an art, the above book fills a long felt need for an authoritative condensed work as a source book in this field. The author is the technical chief for Quaker State Oil Refining Corporation and one of the outstanding leaders in the field of lubricants.

The first part of the book deals with the manufacture of lubricating oils, their properties and other physical and chemical data. The second part presents the application of motor oils in all its various phases. The author discusses tests and specifications in condensed but adequate detail, outlining test methods by which properties are determined. As to refining practices the book studies especially the properties of the different types hydrocarbons, effects of sulfur, and typical processes.

**Physical Chemistry of the Hydrocarbons.** *Editor, Adelbert Farkas. Academic Press, Inc., Publishers, New York, N. Y. Pages, 434. Price, $8.50.*

This "work has been written primarily for the chemist, engineer, or physicist engaged in hydrocarbon technology or research," its publishers say. The first volume, just released, includes nine chapters, written by eight authors; the only one to write two chapters is Norman D. Coggeshall, Gulf Research and Development Corporation.

Hugh S. Taylor, writing its foreword, points out that the men who enter the petroleum industry today should come "equipped with the ultimate that modern physico-chemical science can provide." It is a volume for the graduate or postgraduate student or researcher who is well-versed in the more recent developments in atomic structure theory, valence, chemical optics, and thermodynamics.

**Welding Handbook,** *third edition, compiled by the American Welding Society, 33 West 39th Street, New York 18, New York. Pages, 1650. Price, $12, $13 in Canada.*

More than 30 welding and cutting processes in use by the industry today are covered by this third edition, as well as the welding of ferrous and nonferrous metals and alloys, and the application of welding in different industries. Also included are individual chapters on cost estimating, welding metallurgy, physics welding, etc. More than 300 tables are included in the Handbook, to make it useful for ready reference, and illustrations are generously used to show welding equipment, welding details, and specific applications.

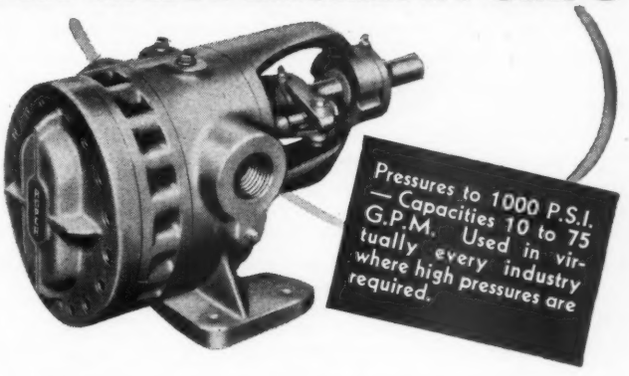
**Quarterly of the Colorado School of Mines—Geophysics,** *Colorado School of Mines, Golden, Colorado. Pages, 103. Price, $1.*

The current issue of the quarterly contains the papers delivered at the conference on geophysics, September 30 and October 1, 1949. This is a number of the seventy-fifth anniversary volume entitled "Mineral Resources in World Affairs." The papers deal with seismic service and research, interpretation of geophysical data, current trends and progress of mining geophysics, recent development of gravity prospecting, etc.

**Drilling and Production Practice 1948,** *Sponsored by the Central Committee on Drilling and Production Practice. American Petroleum Institute, New York, New York. Pages, 317. Price $5.*

This book contains papers on drilling and production practice presented before the Division of Production at the American Petroleum Institute's twenty-eighth annual meeting. These papers are grouped in five sections: Drilling practice, production practice and technology, materials, allocation of production, and well spacing.


WHEN THE HIGH PRESSURE IS ON...
RELY ON ROPER SERIES H PUMPS




Pumps built especially to develop pressures up to 1000 p.s.i. High volumetric efficiency provided by equal size spur gears operating in axial hydraulic balance . . . roller bearings and bronze wear plates reduce friction under heavy load conditions . . . splined drive shaft absorbs thrust loads. Most models can be direct connected, chain, belt, or gear driven. Specify Roper for *your* high pressure job.

Geo. D. Roper Corp.
730 Blackhawk Park Ave.
ROCKFORD, ILLINOIS

ROPER Rotary Pumps

**Secondary Recovery of Oil in the United States,** *by Members of the Standing Subcommittee on Secondary-Recovery Methods, Central Committee on Drilling and Production Practice. Published by American Petroleum Institute, New York, N. Y. Pages, 838. Price, $8.50.*

This second edition contains many of the data that were included in the first edition and the two supplements. It has been revised, partly rewritten, new data published for the first time, and has a subject index in addition to the chronological list of references. The publication represents more than 11 years of work by the Subcommittee. Written in response to an insistent postwar demand for up-to-date information on the most efficient methods for increasing the recovery of petroleum, it gives comprehensive information regarding the production of oil in the various producing states, and contains unpublished facts about this increasingly important subject.

**Natural Gas and Natural Gasoline,** *by R. L. Huntington. McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 18, New York. Pages, 598. Price, $8.*

Purpose of this book, the author states, is to provide text material for students of petroleum, natural gas, chemical and mechanical engineering, and to provide the process and equipment designer with a practical knowledge that the author has gained through his actual field and plant experience. Such topics are covered as the production and transportation of natural gas from the well, condensate and dry gas fields, and the recovery of natural gasoline from the gas, its storage and transportation. The practical approach to many problems involving the design and operation of gas gathering and natural gasoline recovery systems is stressed, and the case method is used freely to illustrate the meaning of laws underlying various operations.

**Arabian Oil,** *by Raymond F. Mikesell and Hollid B. Chenery, The University of North Carolina Press, North Carolina. Pages 184. Price $3.50.*

"Arabian Oil" provides a clear account of American petroleum interests in the Middle East since the 1930's and their relation to our national foreign oil policy. This factual and technical study not only provides useful information regarding the technical, legal, and economic problems of oil recovery in the Middle East, but it also presents a case study of a foreign investment and its relation to U. S. foreign economic policy.

Because of the current shifting of world oil production from the Gulf-Caribbean area to the Middle East, the authors have also sketched a future pattern of world production and trade in this vital resource.

**The Oil Producing Industry In Your State,** *1950 edition. The Independent Petroleum Association of America. Pages, 62.*

A comprehensive statistical and reference book containing complete statistical information on all phases of the oil industry in 26 producing states, as well as charts and graphs dealing with national economic trends in the industry.

The book contains information given in statistical summaries on each state. The charts give the geographical extent and economic contributions of the industry from the year of first recorded production up to January 1, 1950. Copies of the book are available to interested persons by IPAA Information Service, P. O. Box 1019, Tulsa, Oklahoma.

**Quarterly of the Colorado School of Mines.** *Edited by F. M. Van Tuyl and Truman H. Kuhn. Colorado School of Mines. Pages, 343. Price, $3.*

This issue of the quarterly contains the papers delivered at the conferences on Petroleum Geology and Hydrology, Engineering Geology, and Mining Geology September 31 and October 1, 1949, as a part of the program for the observance of the seventy-fifth anniversary of the Colorado School of Mines. Some of the topics included are "The Petroleum Geology of Colorado" by Carroll E. Dobbin, United States Geological Survey, Denver, Colorado; "Discussion of Alteration and Its Application to Ore Search" by Paul F. Kerr, professor of mineralogy, Department of Geology, Columbia University, New York City, and "Geology and Irrigation Engineering" by Richard D. Dirmeyer, Jr., district geologist, United States Bureau of Reclamation, Casper, Wyoming. Bound in heavy-paper cover, it may be obtained from the Department of Publications, Colorado School of Mines, Golden, Colorado.

**Introduction to the Mechanics of Viscous Flow:** *by H. F. P. Purday, Dover Publications, Inc., 1780 Broadway, New York 19, N. Y. Pages, 185. Price, $2.75.*

This small volume fills a long felt want in its field. It is an introduction to three closely related parts of physics: Mechanics of non-turbulent flow, flow of heat by conduction, and heat transfer between solids and fluids. Only an elementary knowledge of the calculus is needed on the part of the reader. Computation tables are included that the author hopes will induce readers to carry out similar problems in which they are interested. Chapters include: Viscous flow in pipes or channels, films of varying thickness, sliding pads and journal bearings, heat flow and boundary convection, orthogonal functions and equations of flow.

**Arabs Oil and History,** *by Kermit Roosevelt. Harper and Brothers Publishers, New York. Pages, 266. Price, $3.50.*

Written with the conviction that understanding between the Middle East and America is vital to both, Arabs Oil and History is a simple account of these people of the Middle East and their way of life. With its land forming a bridge linking three continents, Europe, Asia, and Africa, the Middle East has become one of the most exciting, explosive, and highly prized spots on the map. Its people are beginning to break away from centuries of tribal life. The resulting tensions have the makings of revolutions. The book is informative and valuable for anyone who hopes to understand, travel in, or do business with the countries of the Middle East.

**Gas Facts,** *by The American Gas Association Bureau of Statistics, 420 Lexington Avenue, New York 17, N. Y. 1950, Pages 255, Price $1.*

The fourth edition of the American Gas Association's statistical yearbook, Gas Facts, contains tables, charts and other pertinent data compiled by the association. With the purpose of promoting and developing the gas industry, and coordinating its activities to the end that it may serve to the fullest extent the best interest of the public this bulletin was published. The Bureau of Statistics has compiled the materials collected from individual gas utilities, and transmission companies.

**Annual Review of California Crude Oil Production,** Conservation Committee of California Oil Producers.

This book contains an annual review of the activities of the Committee, and statistical information relative to crude oil production. Much tabular data are presented, including tables on oil production, oil development and new completions, gas production and development, and several topographic maps. The book discloses that production for the year 1949 averaged 912,170 bbl per day, a drop of 17,000 bbl per day from the average of 1948, which was a reversal in the rising trend during the preceding three years.